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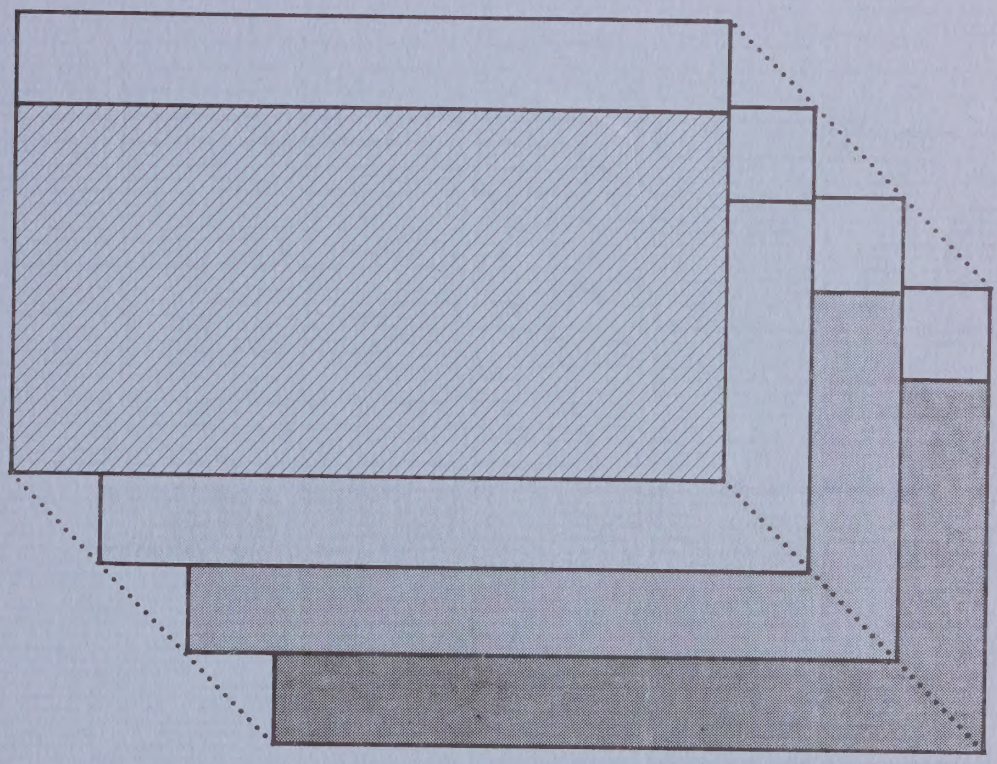
ENVIRONMENTAL MANAGEMENT PLAN FOR THE SAN FRANCISCO BAY REGION

D R A F T

Water Quality Management Plan



ABAG
ASSOCIATION OF BAY AREA GOVERNMENTS

OCTOBER 1977

ENVIRONMENTAL MANAGEMENT PLAN

FOR THE

SAN FRANCISCO BAY REGION

DRAFT WATER QUALITY MANAGEMENT PLAN

water quality management -- CA --
San Francisco metro area

OCTOBER 12, 1977

Table of contents

Table of contents (continued)

Tables

Figures

Chapter—1

Purpose of document

This document is one of twelve draft management plans prepared as part of the Environmental Management Program for the San Francisco Bay Region. The draft management plans, which will be published during September and October, 1977, are as follows:

- Air Quality Maintainence Plan
- Water Quality Management Plan
- 8 county-wide Surface Runoff Control Plans
- Water Conservation Reuse and Supply Management Plan
- Solid Waste Management Plan

At this stage the plans are not in final form. The draft plans are intended to stimulate public discussion of environmental quality in the Bay Region. Comments received will be used to assist in preparing the final integrated Environmental Management Plan (EMP) which will embrace the twelve draft plans.

The purpose of this document is to describe a plan for protecting water quality of the waters of the Bay Region -- the Pacific Ocean, San Francisco Bay, the streams and rivers, and reservoirs. The plan is summarized in the next chapter. Chapters following contain supporting discussion. The plan itself comprises Chapter 7.

Extensive technical analyses were undertaken during the development of this plan. A full report on these analyses will be contained in the final EMP.

Chapter—2

Summary description of the plan

The Water Quality Management Plan is composed of five elements. The first of the elements contains those actions necessary to protect water quality but which do not relate to control of a particular pollutant source. The remaining elements correspond to sources of pollutants that must be controlled. The five elements are:

- Water Quality Management
- Municipal Facilities
- Surface Runoff
- Industrial Discharges
- Miscellaneous Sources

The overall strategy that the plan embodies ensures that effort and funds are expended on those controls that result in the greatest environmental benefit at the least social and monetary cost. Conversely, the strategy avoids the investment of effort and funds in control measures that have insufficient clearly demonstrable environmental benefits.

The problems that the plan addresses are described as an introduction to the plan itself.

PROBLEMS

Water quality in the region declined from the time the area was settled until around 1950. Water pollution control actions taken since that time have resulted in substantial improvements. However, some of the waters remain polluted; that is they remain unsuitable for swimming, fishing or other uses that we might reasonably expect.

Because the existing water pollution control programs, aimed principally at municipal and industrial dischargers, have been quite successful, they form the foundation of the water quality management strategy.

With this sound footing the strategy focuses control efforts on the remaining pollution problems and on pollutant sources that have yet to be dealt with.

Serious water quality problems remaining in the region are:

- Gross pollution as a result of inadequately treated or dispersed municipal and industrial wastewater discharges.
- Subtle and poorly understood adverse effects on aquatic life caused by toxic materials from a variety of sources.
- Bacterial contamination of shellfish.
- The unknown but almost certainly adverse effects of further reductions in freshwater inflow to San Francisco Bay as a result of proposed upstream diversions.
- The unknown but potentially adverse effects of agricultural wastewaters discharged from the proposed San Joaquin Valley agricultural drain.
- The potentially catastrophic effects of a major oil or chemical spill.
- Minor problems resulting from vessel discharges, failing septic tanks and dredging activities.

SOLUTIONS

Solutions to each of the remaining water quality problems are described below in general terms.

Gross Pollution

This problem can be solved by constructing wastewater treatment and disposal systems. When presently planned municipal and industrial facilities are completed in the early 1980's gross pollution will be eliminated. These facilities together with those needed to provide for population and production increases until the end of this century are described in the municipal facilities and industrial discharges control plans.

Pollution Caused By Toxic Materials

There is growing evidence that suggests that some toxic materials are harming aquatic life. Removal of toxic substances from waste discharges and storm runoff is often difficult and expensive. In view of this and the lack of conclusive evidence of harm, the recommended strategy is to reduce the discharge of toxic substances where this can be done easily and relatively inexpensively. At the same time research will be undertaken to determine whether harmful effects are, indeed, occurring and if further removals are justified.

Bacterial Contamination of Shellfish

Contamination of shellfish with bacteria, some of which may cause disease in man, is the reason for the prohibition of commercial shellfish harvesting in the bay. The principal sources of bacteria are municipal sewage discharges, surface runoff, combined sewer overflows and vessel discharges. When the present program of wastewater treatment plan construction is completed municipal discharges will become an insignificant source of bacteria. Combined sewage overflows, that is overflows from combined sewage and stormwater collection systems during storms, are the subject of ongoing control programs in San Francisco and Oakland, the only communities in the region which have them. The control strategy recommended in the plan includes initiating a surface runoff control program and increasing regulation of vessel discharges.

Reductions in Freshwater Inflow to the Bay

The major freshwater inflow to the Bay comes from the Sacramento-San Joaquin Delta. Upstream diversions have substantially reduced flow volumes reaching the Bay, and additional diversions are proposed. The flow reductions are of concern on two counts:

- Certain minimum flows are required in summer to keep salt water away from agricultural and municipal supply intakes in the Delta and to protect migrating fish.

- Winter flood surges from the Delta above a certain magnitude reduce salinity markedly throughout most of the Bay system. This effect persists for several months; many biologists believe that these changes play an important role in the life cycle of some of the fish, crabs and shrimps that live in the Bay.

The strategy for solving this problem has three parts: the first part to be accomplished in the final EMP establishes an interim flow allocation for estuarine preservation as part of the water quality objectives for the region, based on current knowledge. The second part includes studies to determine more accurately the amount of water necessary to preserve the estuary. The third part establishes a permanent flow allocation for this purpose.

The San Joaquin Valley Agricultural Drain

Agricultural productivity in parts of the San Joaquin Valley is impaired by high groundwater levels. Consideration is being given to the construction of a drain designed to lower groundwater levels; this drain will discharge salty, nutrient-laden waters to the bay between Martinez and Antioch. If this occurs, water quality problems in the bay can be prevented by establishing appropriate quality standards for the drain discharge. The standards will be developed in the next several months in cooperation with the Interagency Drainage Program.

Accidental Spills

The quantities of oil, petrochemicals and other hazardous materials being processed in and transported through the Bay Area are expected to increase in the future. The risk of a catastrophic spill will also increase unless effective action is taken. At present responsibility for spill prevention and clean-up is shared by many agencies at different levels of government. It is difficult to determine how effective present practices are. The best solution to the problem is to improve local arrangements for spill prevention and clean-up while supporting national and international efforts to regulate the construction and operation of vessels transporting hazardous materials. In addition, a single agency should be made responsible for monitoring and coordinating, where necessary, the performance of the existing prevention and clean-up arrangements and reporting the results of its monitoring to the legislature or governor.

Miscellaneous Problems

Relatively minor or localized water pollution problems are caused by failing septic tanks, discharges from vessels in confined waters and dredging activities. Stricter, uniform standards for septic tanks together with public responsibility for maintenance of new and certain existing systems are the recommended strategy for on-site disposal problems. To deal with vessel wastes, public education programs and on-shore receiving facilities for wastes from pleasure craft holding tanks are recommended; more stringent measures may be indicated later. In all three categories noted here, monitoring and research programs are advised.

THE PLAN

The Water Quality Management Plan consists of a series of planning principles or policy statements. The statements are grouped into five individual management elements. Each policy statement is accompanied by a set of actions which lead toward implementation of the policy. The plan elements and their associated policies are as follows:

- Water Quality Management Element
  - Improve understanding of the San Francisco Bay-Delta System and the fate and effects of pollutants entering it.
  - Establish a continuing planning process for water quality management.
  - Ensure that water pollution control facilities or measures effectively protect water quality.
- Municipal Facilities Element
  - Provide facilities for municipal sewerage service and water quality protection.

- Encourage consolidation of treatment facilities and discharge of wastewater to well-mixed receiving waters.

- Accelerate progress toward wastewater reclamation and reuse.

o Surface Runoff Element

- Establish a program of surface runoff controls that emphasizes low-cost measures to reduce the pollutant load from this source.

o Industrial Dischargers Element

- Provide facilities needed for industrial wastewater treatment and disposal and water quality protection.

o Miscellaneous Sources Element

- Improve wastewater disposal practices in unsewered areas.

- Reduce sewage pollution from small boats in marinas, harbors and environmentally sensitive areas.

- Improve coordination and performance of agencies in preventing and dealing with oil and chemical spills.

The plan elements are described briefly in the following section.

Water Quality Management Element

The water quality management element contains those actions that are necessary to protect water quality but do not relate to control of a particular pollutant source.

The formation of a San Francisco Bay Delta Research Program (SFBDRP) is recommended. The SFBDRP will have four basic functions:

o monitor the effects of waste discharges on the bay and ocean. This activity is presently the responsibility of individual waste dischargers.

o conduct research into and develop possible solutions to water quality problems affecting the bay such as pollution due to toxic materials, the agricultural drain and reductions in delta ouflow.

- coordinate activities of other research organizations working in the Bay, such as the United States Geological Survey.

- store and manage data, making it accessible and useful to reseachers, regulatory agencies and interested citizens.

The information gathered by SFBDRP will be used to make pollution control efforts more effective. Reorganization of receiving water monitoring will lead to an improvement in the quality of technical work at a reduced cost.

A procedure is recommended for updating the Water Quality Management Plan as information from SFBDRP accumulates. The plan will also be updated as required to remain consistent with other regional environmental goals such as air quality maintenance and preservation of open space.

A number of actions are recommended to ensure that water pollution control facilities or measures do, in fact, protect water quality. Present receiving water quality monitoring arrangements will be modified to be consistent with the new centralized SFBDRP. Effluent monitoring will remain the responsibility of dischargers. The results of monitoring will be compiled and published annually as a guide to progress in water pollution control. A clearinghouse will be established to coordinate wastewater treatment plant operator training programs, exchange technical information and undertake any other functions that will improve the effectiveness of pollution control efforts.

Municipal Facilities Element

The municipal facilities element includes a list of all sewage collection, treatment and disposal facilities needed in the next twenty-three years. The facilities are needed to protect water quality and to provide sewerage service for the region's growing population. Responsibility for building, operating and maintaining the facilities belongs to the cities and special districts. The cost of building and operating the facilities will be equivalent to $240 million each year for the next twenty years expressed in 1977 dollars. Over 80 percent of the construction cost will be spent in the period 1977 thru 1982. Assuming that State and Federal grants continue at the present level about 400 million dollars must be raised at the local level through sewer service charges.

Surface Runoff Element

Surface runoff control plans are being developed by Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo Counties. The plans which will be completed in October 1977 comprise, together with San Francisco's existing plan, the surface runoff element of the water quality management plan.

Industrial Dischargers Element

The industrial dischargers element addresses both industries that discharge wastewater directly to the environment and those that discharge to a municipal sewerage system. The element includes a list of all significant direct industrial discharges. If present federal laws remain unchanged most of these direct dischargers must upgrade their level of waste treatment by 1983. The cost of constructing and operating new facilities is estimated to be equivalent to $25 million each year for the next twenty years expressed in 1977 dollars. Costs will be borne by individual industries.

The element requires that industrial wastewater discharged to a municipal sewerage system be pretreated to a degree necessary to protect the municipal treatment plant and its operating personnel from harm and to protect the ultimate receiving waters as currently required by the State. The degree of pretreatment necessary may be influenced in the future by the results of SFBDRP's research programs. Federal pretreatment requirements are being revised at the present time; these revisions may also affect local pretreatment requirements.

Miscellaneous Sources Element

The miscellaneous sources element contains measures designed to prevent pollution from on-lot waste disposal systems (such as septic tanks), vessel discharges and accidental oil and chemical spills.

Establishment of uniform minimum guidelines for septic tank design and construction is recommended. Developments currently served by septic tanks and experiencing problems will be permitted to establish a public septic tank maintenance district as an alternative to sewer construction if there is a reasonable expectation that on-lot systems will work. Otherwise a sewer system must be built. For new developments to be served by on-lot systems public management will be required.

Actions recommended to deal with vessel discharges emphasize enforcement of existing or slightly strengthened regulations and boat owner education programs. If, after several years of monitoring these actions fail to solve the problem it may be necessary to prohibit vessel discharges in parts of the bay. Construction of holding tank pump-out facilities at all marinas and harbors will be required.

Responsibility for prevention and clean-up of oil and chemical spills is shared by many agencies. Because of this division of responsibility it is difficult for decision-makers and interested individuals to determine whether present practices are effective. The key recommended action is designation of a single agency to monitor existing practices, provide coordinaton where necessary, and report annually on any problems identified.

Chapter—3

Laws, regulations and earlier plans

This water quality management plan is the most recent in a series of plans dealing with water pollution control in the bay region. The preparation of each plan has been mandated by law. The laws themselves were enacted in response to citizen concern for environmental protection. This section describes the goal of the present plan and its specific legal mandate together with a more general description of water pollution control legislation and earlier plans.

GOALS AND OBJECTIVES

The goal of the water quality management program is to produce a plan that will lead to the greatest possible improvement in water quality and compliance with Federal and State standards and objectives at the earliest possible date. The plan will have no social, economic or secondary environmental effects so unacceptable as to prevent implementation.

LEGAL MANDATE

The Federal Water Pollution Control Act Amendments of 1972 provide the mandate for preparation of the plan. The Act states that:

> "The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. In order to achieve this objective it is hereby declared that, consistent with the provisions of this Act--
>
> 1) it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;
>
> 2) it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983;
>
> 3) it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited;
>
> 4) it is the national policy that Federal financial assistance be provided to construct publicly owned waste treatment works;
>
> 5) it is the national policy that areawide waste treatment management planning processes be developed and implemented to assure adequate control of sources of pollutants in each state."

The key goal of the Act is that swimmable and fishable waters be achieved wherever possible by 1983. The provisions of section 208 relevant to management of water quality in the Bay Area are discussed below.

Section 208 of the act requires the Governor to designate agencies to prepare and implement areawide waste treatment management plans for a designated area. Within two years after the planning process is initiated, the designated agency--in this case ABAG--is to prepare a plan that must be certified by the State Water Resources Control Board and subsequently approved by EPA. This plan is to include, but not be limited to, control measures for improving water quality and the institutional and financial mechanisms necessary to implement control measures for the following sources of water pollution:

- municipal wastewater
- industrial wastewater
- storm runoff
- other nonpoint sources

The agency is also to assess the social, environmental, and economic impacts of carrying out the plan. The Governor, in consultation with ABAG, will designate a management agency or agencies to implement the approved plan. No Federal grants for water pollution control facilities will be made to any agency not so designated, and no permit for the discharge of liquid wastes will be issued unless the discharge is consistent with the plan. The Act requires permits for all discharges to navigable waters.

WATER QUALITY MANAGEMENT PRIOR TO 1970

Water quality management is perhaps a rather grandiose description of water pollution control activities prior to the 1960s. Before 1949 the State Department of Public Health was responsible for the regulation of sewage disposal facilities. The Health Department issued discharge permits based on public health considerations alone; little or no attempt was made to protect fish and wildlife or aesthetic values. Municipalities and special districts built and operated sewage collection, treatment and disposal facilities in response to health department requirements and to citizen concerns regarding nuisance and aesthetics.

This approach was largely ineffective in dealing with bay pollution. In an effort to remedy the situation statewide the State Water Quality Control Board and nine Regional Water Quality Control Boards were established by the State Legislature in 1949. Although some progress was made it became clear that there was a need for an overall plan or grand strategy to provide direction for water pollution control activities. In 1965, the State Legislature authorized the State Board to conduct a study of the effects of waste discharges on the bay and delta and to develop a comprehensive plan for control of water pollution.

The study, known as the Bay-Delta or Kaiser Study, began in late 1966 and the final report was published in June 1969. The study considered a number of alternatives for controlling pollution. The conclusion was reached that the best alternative was one which involved eliminating discharges to the bay, conveying most of the wastewater to the Pacific Ocean and reclaiming the remainder for industrial and agricultural use.

The creation of a regional planning and operating agency was recommended to implement the program. The State Legislature failed to pass a bill forming such an agency. Without a suitable operating agency having regional authority, implementation of the plan became impossible.

LEGISLATIVE ACTIONS IN THE LATE 1960s AND EARLY 1970s

In 1967, the powers and responsibilities of two State agencies--the State Water Rights Board and the State Water Quality Control Board--were assigned to a new State Water Resources Control Board. In 1969, the legislature passed the Porter-Cologne Water Quality Control Act. This new law expanded the term "beneficial use" of California waters to include aesthetic enjoyment and preservation and enhancement of fish and wildlife. In addition, the law required that comprehensive water quality control plans be prepared for each of the sixteen major hydrographic basins in California. In the years following the passage of the Federal Water Pollution Control Act Amendments of 1972 the provisions of the Porter-Cologne Act were amended to complement the new Federal legislation.

The passage of the Federal Water Pollution Control Act Amendments in 1972 represented a radical departure from the philosophy which had underlain all previous State and Federal water pollution control legislation. In the past, legislation had emphasized the establishment of in-stream water quality standards to protect beneficial uses and had not specified effluent quality at the end of the pipe provided no violation of in-stream standards occurred. Because the cause and effect relationship between waste discharges and pollution in the receiving water is often poorly understood, establishment of a level of waste treatment or effluent requirements for a particular discharge frequently became the subject of controversy and extended discussion. The progress of water pollution control was severely hampered by these controversies and the delays they caused.

Recognizing these difficulties, the authors of PL92-500 refocused regulation on the quality of discharged waste as it emerged from the pipe regardless of the characteristics of the receiving waters. All discharges to navigable waters must be of a specified improved quality before discharge can be permitted. A minimum level of treatment for all discharges was set.

THE WATER QUALITY CONTROL OR BASIN PLAN

In order to comply with the provisions of both the Porter-Cologne Act and the Federal Water Pollution Control Act Amendments, the State Water Resources Control Board and the Regional Water Quality Control Board undertook to prepare a water quality management plan for the San Francisco Bay basin.

Aware of the fate of the earlier Bay-Delta Plan the basin planners decided on a different approach. Rather than developing a plan that would have to be implemented by a new "super" agency, it was decided that the new plan must be acceptable to and implementable by existing agencies whenever possible. Consequently the Basin Plan was shaped at least as much by political considerations as by technical analysis of water quality problems.

The basin planners were helped somewhat in their endeavors by the fact that sub-regional plans for sewerage service had been completed or at least initiated throughout the area in the interval between publication of the Bay-Delta study and the start of basin planning. Although critical of the large-scale consolidation, proposed in the Bay-Delta study many local sewerage agencies agreed that some degree of consolidation was economically advantageous. Consequently a number of joint powers agreements were signed and twelve subregional planning studies were conducted between 1970 and 1973. The results of these studies formed the basis of the Basin plan.

THE SECTION 201 FACILITIES PLANS

Section 201 of the Federal Water Pollution Control Act Amendments requires that applicants for grants for construction of municipal wastewater facilities must demonstrate that they have thoroughly studied and evaluated all reasonable alternative waste management techniques that will accomplish the proposed projects objectives. Section 201 facilities planning studies are preliminary engineering studies and represent the last planning step before proceeding with design and construction. Studies of this type have been completed or are in progress throughout the Bay Area and must conform with the overall Basin Plan. In the future they must conform with the EMP.

The decision was made, early in the Environmental Management Program, to treat the facilities recommended in the Section 201 plans as if they were already built in order to avoid delaying compliance with Federal requirements. This plan did not reexamine issues already settled in the Section 201 planning process.

RELATIONSHIP BETWEEN THIS PLAN AND EARLIER PLANS

It is evident from the foregoing that the portion of the EMP that deals with water quality management is one of a series of plans. This is to be expected; environmental planning is a dynamic process; any plans must be adapted to changing circumstances. Apart from the fact that

the present plan updates earlier plans, there are three other important differences. Unlike the earlier plans this plan integrates air, water and solid waste planning. Secondly, this plan has been prepared locally and is guided by a policy body of elected officials and other interest group representatives. Thirdly, this plan emphasizes control of non-point sources of water pollutants.

The relationship between this and other plans is best described by comparing the present situation with that which will exist when this plan is completed and approved. At present the Basin Plan is the document that guides water quality management. The Basin Plan describes the level of water quality that must be attained and an outline of the actions that must be taken to attain it. The Basin Plan is shaped principally by State and Federal water quality requirements and does not take account of other environmental goals such as air quality protection. The Section 201 facilities plans -- those plans that describe in detail the wastewater facilities needed -- must conform with the Basin Plan.

After the EMP is adopted in August '78 it will replace the basin plan as the instrument guiding water quality management. The EMP is shaped not only by State and Federal legal requirements but also by local environmental tradeoffs and priorities. The Section 201 facilities plans must in the future conform with the EMP.

Chapter—4

The water pollution problem and its causes

This section of the report describes the water resources of the San Francisco Bay Region, the sources of pollutants that affect them and the nature and seriousness of existing and future water quality problems.

WATER RESOURCES OF THE BAY REGION

The predominant topographic feature of the region is the San Francisco Bay - Sacramento/San Joaquin Delta System. This is the focal point of the description of regional water resources. Figure 1 shows the surface waters of the region.

THE BAY - DELTA SYSTEM

San Francisco Bay extends from the east end of Chipps Island, near the City of Pittsburg where the Sacramento and San Joaquin Rivers meet, to the mouth of Coyote Creek, near the City of San Jose. Halfway between the bay's extremities, the Golden Gate is the bay's only link with the ocean. At mean tide the surface area of the bay is approximately 435 square miles.

The bay is quite shallow with an average depth of only 20 feet. Apart from the dredged channels, deep water areas are mostly confined to the Central Bay (San Francisco - Oakland Bay Bridge to Point Richmond). The depth of the South Bay averages 15 feet and the North Bay 17 feet.

Water movements within the bay are influenced in a complicated way by wind, tides and precipitation runoff. Ocean water enters the bay through the Golden Gate as the tide rises. Freshwater enters the bay from surface streams, principally the Sacramento-San Joaquin Delta, and waste discharges. Water leaves the bay through the Golden Gate as the tide ebbs and some is evaporated from the water surface.

At low tide the bay contains 210 billion cubic feet of water. The volume of water between mean-higher high water and mean lower-low water, referred to as the tidal prism, is approximately 50 billion cubic feet. This amount of water leaves the bay through the Golden Gate during the six-hour period between high- and low-tide and represents about one-quarter of the total volume of water within the bay at low tide. The tidal prism is almost equally divided between the North and South Bays; 25 billion cubic feet of water leave each during ebb tide.

As the tide rises, 50 billion cubic feet of water must enter the bay again. Not all the entering water is fresh ocean water, however. It is estimated that approximately three-quarters of the water entering the bay on the flood tide is the same water that just left a few hours previously on the ebb. Thus, the volume of new ocean water entering the bay with the incoming tide, the tidal exchange volume, is 12.5 billion cubic feet. Clearly a similar quantity of water must leave the bay on the ebb tide, never to return. This permanently exiting water provides the principal means by which pollutants can be moved out of the bay and into the Pacific Ocean. To a lesser extent, pollutants are carried out of the bay in the freshwater outflow from the delta.

Figure 1.

Surface waters of the San Francisco Bay Region

Almost half of California lies within the watershed draining into San Francisco Bay through the Sacramento-San Joaquin Delta. Over 95 percent of the freshwater flow into the bay comes from the delta.

In the last fifty years freshwater outflow from the delta has been significantly reduced as a result of the construction of dams and diversions on the Sacramento and San Joaquin Rivers and their tributaries. Water is diverted from the delta by both the Federal Central Valley Project and the State Water Project for use in the San Joaquin Valley and in Southern California.

It is the large freshwater inflow to the bay that makes the bay an estuarine system rather than a simple embayment. The mixing of fresh and saline ocean waters produces an environment of great biological importance and productivity. The tidal marshes and mud flats that are abundant in the estuary are regarded by ecologists as among the most fertile of environments.

THE PACIFIC OCEAN

The portion of the Pacific Ocean that this plan addresses extends from Tomales Bay in the north to Point Ano Nuevo near the Santa Cruz County line in the south and an undetermined distance offshore. The coastal waters of the region are cold, marine waters, their characteristics influenced by the southward flowing California Current and the seasonal upwelling of bottom waters. The coastal waters are also influenced markedly by the huge quantities of water moving in and out of the bay with the tide.

OTHER SURFACE WATERS

The other surface waters of the region include streams and rivers, lakes and reservoirs. With the notable exception of the Sacramento and San Joaquin Rivers, which are regarded here as part of the bay-delta system, the surface streams of the region are relatively insignificant. Principal among them are the Napa and Petaluma Rivers, Sonoma Creek, Alameda Creek, and the Pajoro River. Most of the smaller streams dry up in the summer.

The principal reservoirs and man-made lakes in the region are Lake Berryessa in Napa County, Crystal Springs Reservoir in San Mateo County, Nicasio Reservoir in Marin County, Calaveras and Anderson Reservoirs in Santa Clara County, Del Valle, San Antonio and San Leandro Reservoirs in Alameda County and San Pablo and Briones Reservoirs in Contra Costa County.

HISTORIC WATER QUALITY

Before man's intervention, water quality in the bay region was a function of complex but natural factors: the wind, the tides, the storms and their erosion products and the cycle of life in the waters. Now the equation has become still more complex with the addition of man's influences. The volume and character of freshwaters entering the bay have

changed as water has been diverted upstream of the delta and the land surface is converted from natural vegetation to city streets and crop acreage. The size of the bay itself has been reduced as the shallow tidal marshes have been filled and converted to urban uses. In addition, the bay has become a convenient dumping ground for the by-products of civilization, domestic sewage, industrial waste and agricultural return flows, and the incidental recipient of oil spills and aerial fallout.

The determination of whether the present level of water quality is satisfactory and if not what can be done about it lies at the heart of the present planning program and is consequently dealt with at length in the following section. That analysis can be placed in perspective, however, by some consideration of how water quality has changed in the past.

It is extremely difficult to develop a detailed picture of how water quality has changed in the region over the last two centuries for several reasons. Little definitive data was gathered until the 1950s. Even today, there is no comprehensive region-wide water quality monitoring program. In the absence of long-term data a subjective but useful picture of changing conditions can be pieced together from a variety of sources. A diagramatic representation of how bay water quality has probably changed is shown in Figure 2.

Water quality and fisheries in the bay declined rapidly in the latter part of the nineteenth and first half of the twentieth centuries. During the last thirty years there has been an improvement in water quality as a result of the construction of wastewater treatment and disposal facilities. A number of water quality problems remain.

PRESENT WATER QUALITY PROBLEMS

The definition of a water quality problem used in this plan is "impairment of a desired beneficial use." As noted earlier, the Water Quality Control or Basin Plan identified existing and potential beneficial uses for the waters of the region. Thus the working definition of pollution is anything that prevents these beneficial uses from occurring either now or in the future. In addition even where water quality is higher than is necessary to support beneficial use any action that degrades water quality is regarded as pollution.

Existing water quality problems and their probable causes are summarized in Table 1. In general the problems are thought to be caused by the discharge of pollutants from a variety of sources and by the reductions in freshwater flow into the bay from the delta that were described earlier. Some of the problems that must be solved before the bay can be regarded as unpolluted are described below.

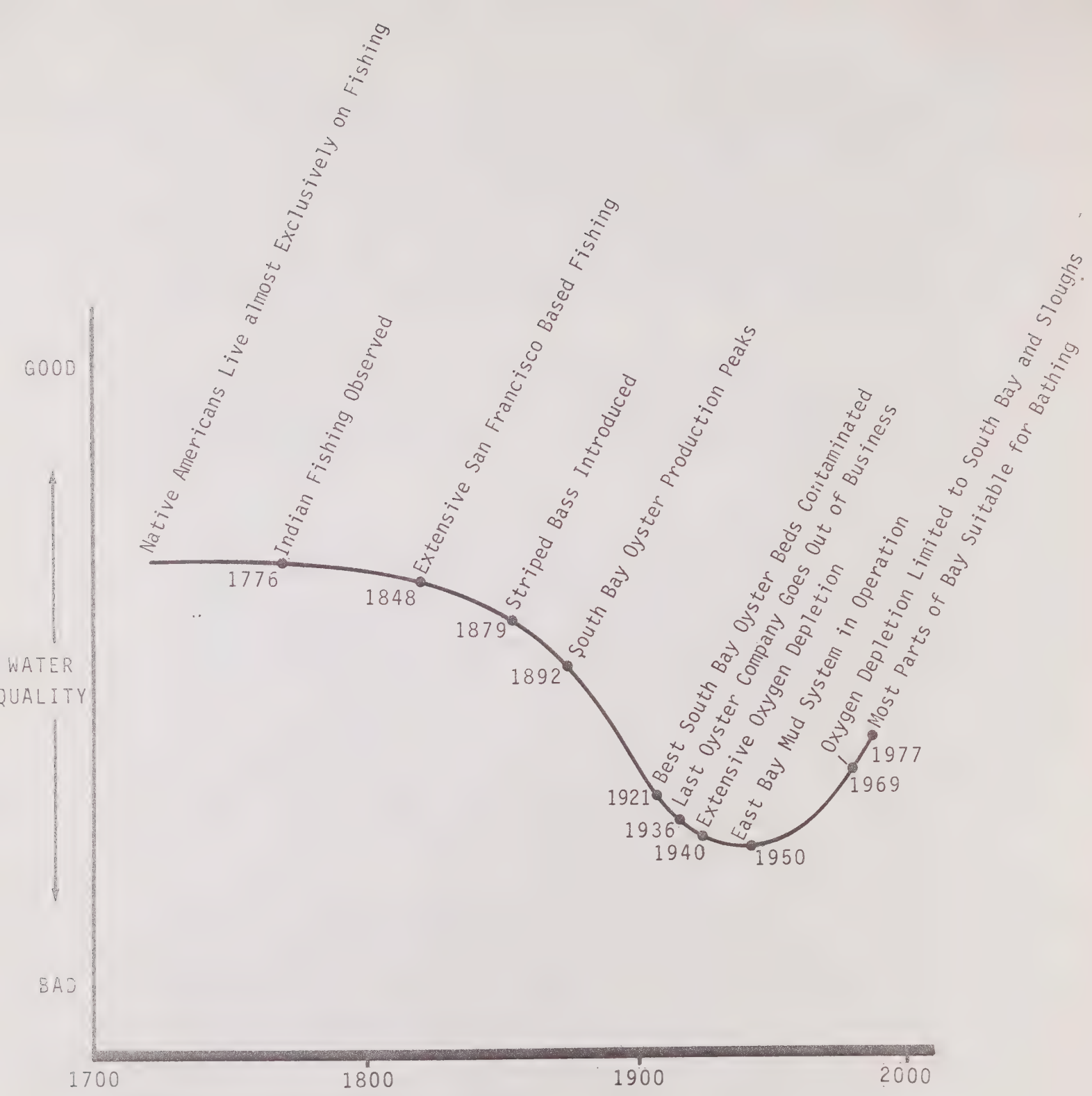


Figure 2.

Historic trend in water quality

Table—1.

Water quality problems and their causes

Impaired Beneficial Use	Water Quality Problem Resulting In Impairment of Beneficial Use	Probable Cause
Commercial and sport fishing - fish migration and spawning	Oxygen depletion, effects of toxic materials, reductions in freshwater flow	Municipal and industrial discharges, surface runoff, accidental spills, freshwater diversion
Water contact recreation	High bacteria counts, particularly near the shoreline	Municipal discharges, vessel discharges, surface runoff, combined sewer overflows
Non water-contact recreation	Floating debris, oil slicks, algae blooms	Surface runoff, accidental spills, vessel wastes, municipal and industrial discharges, improper trash disposal
Shellfish harvesting	High bacteria, virus and metals concentration in shellfish flesh, neoplasms (abnormal growths) in mussels	Municipal and industrial discharges, surface runoff, vessel wastes
Wildlife Habitat	Oxygen depletion, effects of toxic materials, reduction in freshwater flow	Municipal and industrial discharges, surface runoff, accidental spills, freshwater diversion

- Beds of mussels, oysters, and clams are widespread and well-populated. Commercial and recreational harvesting could be an important activity, but this resource is for the most part untapped. These shellfish and the waters overlying the beds are contaminated. The known types of contamination include viruses, bacteria and, in some beds, heavy metals--lead cadmium, mercury and the like. The sources of contamination include storm runoff, some sewage discharges, waste from boats and ships, and accidental spills. Dredging and dredge spoil disposal have some isolated effects.

- The dungeness crab, once an important commercial resource in the bay and in ocean waters off the Golden Gate, has virtually disappeared.

- Fresh water coming from the Sacramento-San Joaquin Delta affects the bay system except south of Dumbarton Bridge. Changes in delta outflow--in its quality or in the way the flow fluctuates--could have serious effects on aquatic life in the bay.

- There is some evidence suggesting that animal species living in or depending on the bay area are being adversely affected. For example, there has been an increase in premature births in harbor seals. There is evidence that egg shells of the peregrine falcon are thinner; the same phenomenon has been observed for other birds such as the ashy petrel and common murre. These effects are associated with derivatives of DDT, which has been banned. Other pesticides and organic compounds are now showing up in analyses of bay waters. Heavy metals are found in bay waters and sediments. There are only a few places where these substances are at levels of acute toxicity, but little is known of their long-term effects. Mussels in the bay have been found with cancer-like growths and the dungeness crab has all but disappeared from the bay--perhaps the result of pollution. All of these examples point to pollutants that occur at low concentrations in the water and whose effects are cumulative and/or long term.

- There are localized areas where algal or plant growth is a problem. Alameda Beach is one area, Suisun Bay another. Nutrients in sewage or storm runoff can stimulate this growth. The proposed agricultural drain that would carry nutrient-rich water from the Central Valley to the north bay could cause serious problems.

- The aesthetics of the bay are adversely affected by litter and debris. The major source of this is storm runoff and in some instances, spills of oils or chemicals.

POLLUTANT SOURCES

The waters of the region are affected by pollutants from a wide variety of sources. Sources can be divided into two groups: point sources of pollutants and non-point or diffuse sources of pollutants. Point sources are those that discharge pollutants to the natural waters at a single easily identifiable location. Examples of point sources are municipal and industrial wastewater treatment plant discharges. Non-point sources are those that cause pollutants to enter the receiving waters at many locations. Examples of non-point sources are aerial fallout, surface runoff and vessel wastes. Figure 3 shows the expected trend in waste flows and loads from different sources between 1975 and 2000. The waste load estimates are based on ABAG's Series 3, Base Case 1 population, land use and employment projections. The drop in certain pollutant loads from municipal and industrial sources in the near future are the result of presently planned (or under construction) facilities coming into operation. No additional controls of other pollutant sources are assumed.

Flows and loads entering the region from the Sacramento-San Joaquin Delta and from the proposed San Joaquin Valley agricultural drain are included for comparison.

Some conclusions that can be drawn from the figure are:

- By far the most significant source of fresh water to the bay is the outflow from the delta. All other sources are small in comparison. Delta outflow is a major or at least significant source of most pollutants, as well. However, pollutant concentrations are generally quite small in delta outflow. The large water volume is responsible for relatively large pollutant volumes.

- Biochemical Oxygen Demand (BOD) is a measure of organic material in the water readily available to bacteria as food. Elevated BOD levels enable bacteria to multiply significantly, using up dissolved oxygen in the water. Adequate dissolved oxygen is essential for fish, shellfish and all other aquatic animal species. The largest present BOD contributing category is that of point sources. By 1985, compliance with current requirements will markedly reduce this contribution.

- Nitrogen (chemically combined, not free atmospheric nitrogen) is a major plant nutrient that, in many water bodies, can be responsible for nuisance blooms of algae. The point source category is the largest contributor, and new treatment programs will not affect this much. Delta outflow is significant, but the concentration levels are low. The proposed agricultural drain, if built, will become a significant contributor unless nitrogen is removed by treatment. This agricultural return flow, too salty for further irrigation use, will also contain high levels of nitrate.

Figure 3.

Fresh water and pollutants entering the bay

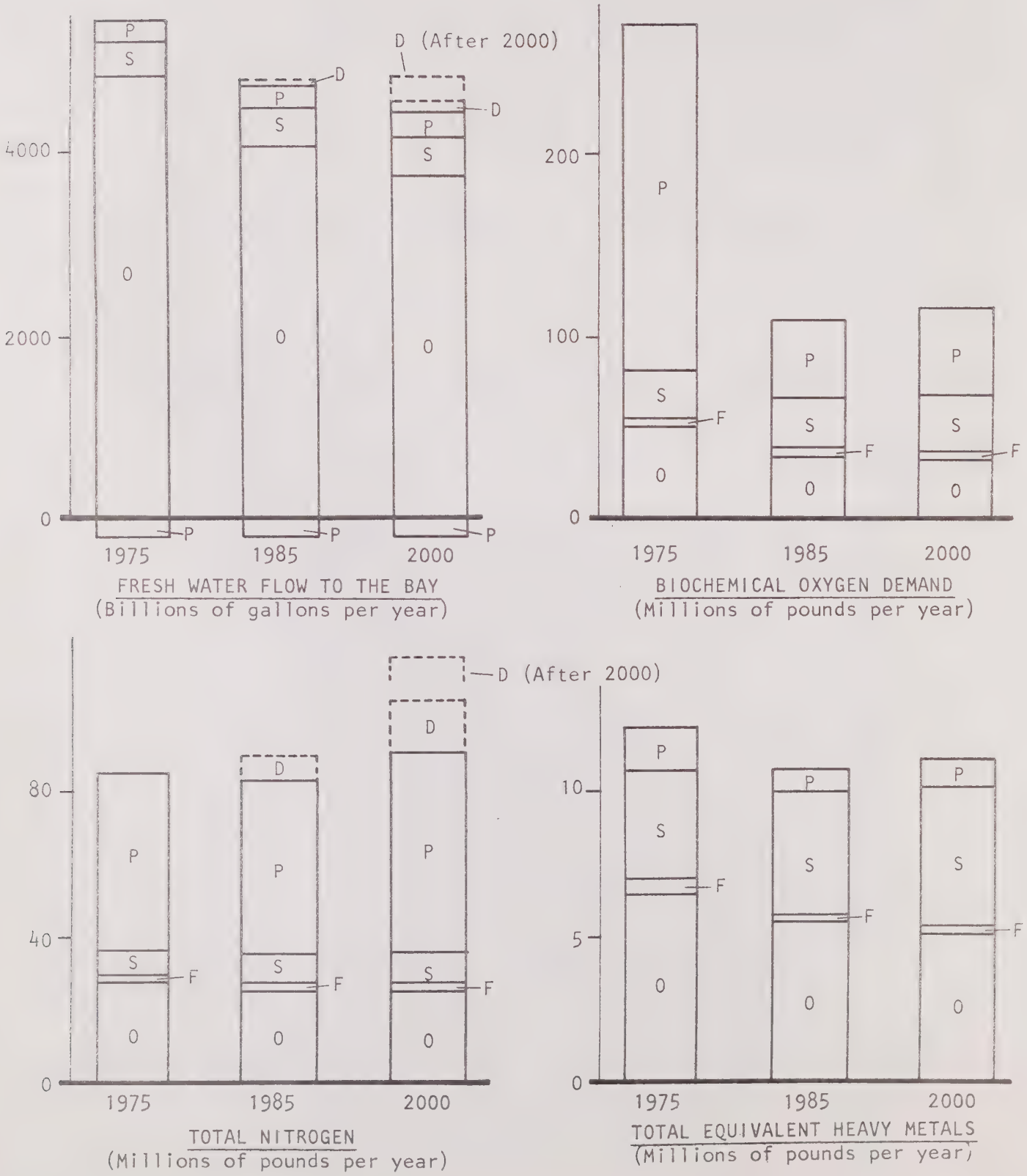
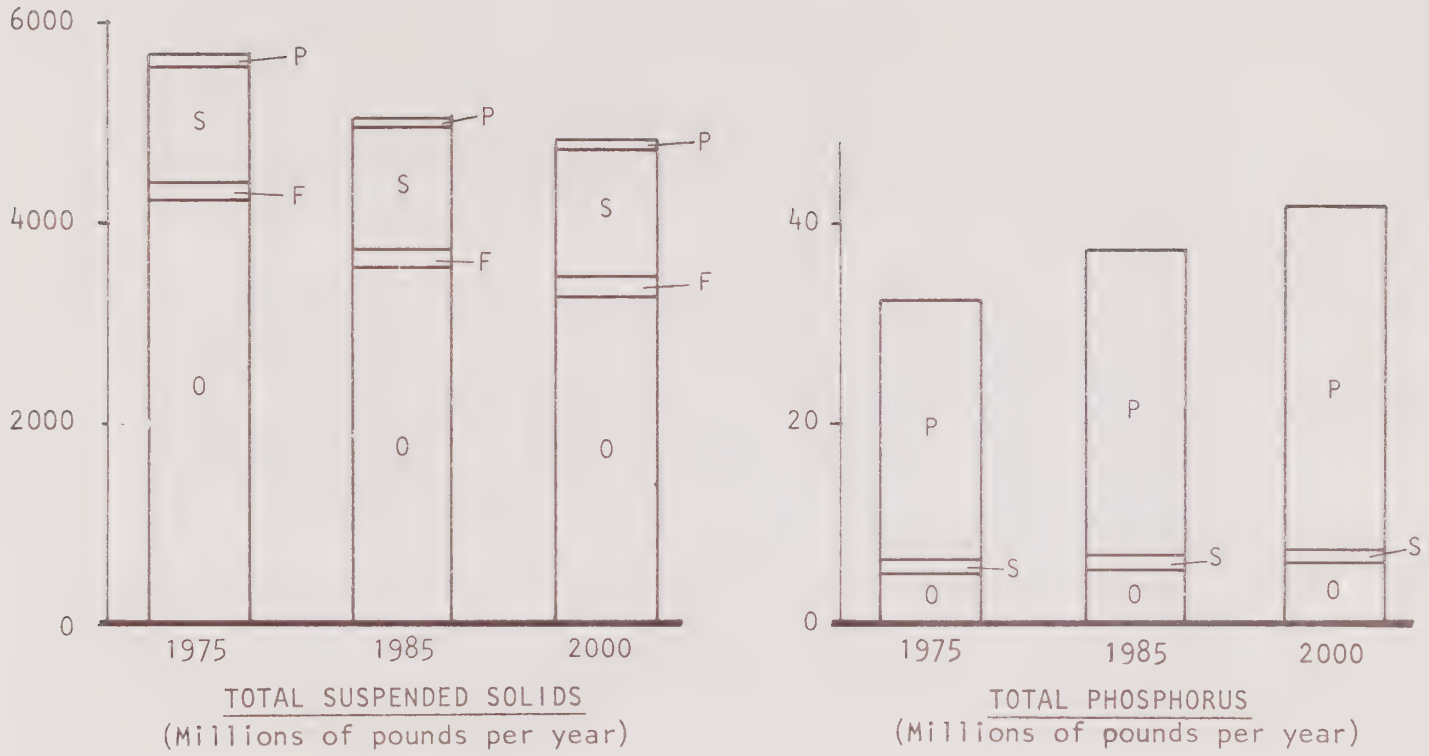


FIGURE 3., Cont'd.



NOTES: P = point sources (municipal and industrial discharges).

S = surface runoff.

F = fallout over bay from atmosphere (rainfall and dustfall). "Flow" in this category = evaporation less precipitation, a net removal of water.

O = outflow from Sacramento-San Joaquin Delta to bay. Pollutant loadings in this category are very approximate.

D = proposed San Joaquin Valley agricultural drain.

- Total Equivalent Heavy Metals is a weighted composite measurement of the amounts of eight reasonably common toxic metals being discharged. Any of these, in sufficient concentration, can have damaging effects on aquatic animals and plants. The largest contributing sources are surface runoff and delta outflow. The concentration levels in delta outflow and in surface runoff from non-urban areas are quite low. In surface runoff from urban areas, estimated concentrations are an order of magnitude higher. The larger part of surface runoff heavy metals comes from urban areas.

- Total Suspended Solids (TSS) is finely divided solid material in water, removable by filtration. The major source category is Delta outflow, where the material is mainly silt and clay particles. From point sources, particularly municipal treatment plants, TSS is largely organic material. From surface runoff, TSS is a mixture of soil and organic particles. A substantial part of the heavy metal load, as well as other toxicants, is associated with the suspended solids.

- Phosphorus, like nitrogen, is a major plant nutrient. The major contributing category is that of point sources. New treatment capabilities will not reduce phosphorus loads to the Bay.

Chapter—5
Possible solutions

Before solutions to the remaining water pollution problems can be found, a detailed analysis of the problem must be undertaken. The problem analysis proceeds in two steps. First, it is necessary to determine which of the existing water quality problems will remain when presently planned wastewater facilities are built. Second, various methods for reducing the pollutant loads responsible for the remaining water quality problems must be evaluated and the most effective identified.

Based on an analysis of the trend in waste loads imposed on the surface waters and on the results of water quality simulations, it was concluded that most of the more obvious problems, oxygen depletion in the South Bay and in the sloughs receiving waste discharge and bacteriological contamination due to inadequately disinfected effluents, will recede as presently planned wastewater facilities come into operation. The most serious problems that will remain will be those that result from the discharge of toxic materials to the bay; bacterial contamination of shellfish after storms and the reductions in freshwater inflow from the delta. Lesser or localized problems will result from failing septic tank systems, vessel discharges and accidental oil and chemical spills. The discharge of agricultural wastewater from the proposed San Joaquin Valley may also pose problems.

CONTROL OF TOXIC MATERIALS

Some investigators believe that certain toxic materials are adversely affecting aquatic life. Concentrations of certain heavy metals in south bay waters are approaching levels at which chronic toxic effects on the Pacific oyster have been observed in laboratory tests. Many of the mussels found in the bay exhibit neoplasms or abnormal growths thought to be caused by synthetic organic compounds.

There are three ways to reduce toxicant loads to the surface waters of the region: control of surface runoff, additional wastewater treatment before discharge and elimination of discharges to surface waters by reclaiming wastewater and using it on the land.

Control of Surface Runoff

It is estimated that about 75 percent of total metals input to the bay originates from surface runoff (excluding inputs from aerial fallout and delta outflow). A considerable proportion of the organics is also thought to be contained in polluted runoff.

Certain types of surface runoff control measures have the potential for reducing the total amount of toxic material available for flushing into the bay at a relatively low cost. Present street-cleaning programs are

not designed with surface runoff control in mind. Their principal purpose is the removal of unsightly litter and to a lesser degree rat and insect control. Relatively minor changes in existing programs can be expected to reap considerable benefits by improving the pick-up rate of fine particulate material from the curbside, the source of much of the toxic metals. Thus, unlike further treatment of municipal and industrial wastewaters, surface runoff controls offer a means of reducing the input of toxicants to surface waters at a modest cost. It should be recognized, however, that data on the effectiveness of street-sweeping in removing particular substances is sparse and consequently the results of a control program are somewhat uncertain.

Additional Treatment of Point Sources

Toxic materials are contained in both municipal and industrial wastewaters. Some of these toxic materials are removed by conventional wastewater treatment provided at existing and planned treatment facilities. These facilities are not designed specifically to remove toxic materials, however. Additional removals can be obtained by using more advanced treatment processes.

In the region most of the metals discharged from point sources are contained in treated municipal wastewater. Industries that discharge wastewater directly to the environment (direct industrial sources) do not appear to contribute large toxicant loads although information on the subject is rather sparse. About half the metals in municipal wastewater comes from homes, the remainder coming from industries that discharge to the municipal sewer (indirect industrial sources). The metals contained in domestic wastewater come from very diffuse sources which are almost impossible to control. An example is lead and zinc dissolved from plumbing fixtures in homes. In the case of the indirect industrial sources, a large fraction of the metals frequently emanate from a small number of plants or workshops and are inherently easier to control. Typical sources are independent metal plating and finishing shops, electronic equipment manufacturers and photographic processors.

Most metals can be removed from wastewaters by a chemical precipitation process. In terms of total metals removed per dollar invested in treatment, it is usually more cost-effective to treat a few concentrated waste streams near their source than to treat the entire rather dilute municipal wastewater stream at the municipal treatment plant. The same reasoning holds true for synthetic organics although in this case the most appropriate treatment process is carbon absorption. Thus the objective of removing additional toxicants from the municipal waste stream can usually be accomplished more efficiently by selective pretreatment of industrial wastewaters rather than by increasing levels of treatment at the municipal plant.

Discharge Elimination

An effective way to prevent toxicants from entering surface waters is to reclaim wastewaters and eliminate the discharges to surface waters. Reclamation opportunities are limited, however, by the fact that the trace metals and synthetic organic compounds that pose a threat to

aquatic life may also threaten human health or the quality of soils and groundwaters. At present, and for the foreseeable future, reclaimed wastewater can only be used for secondary uses that do not involve human ingestion, such as landscape irrigation and industrial cooling.

In 1975 approximately 2 percent of the municipal wastewater generated in the Bay Area was reclaimed. In general, wastewater reclamation is only practiced where there is an acute need for water, where unusual circumstances make reclaimed wastewater prices competitive with other water supplies or where discharge to surface waters is prohibited or stringently regulated. Even if the financial problems can be overcome, the limitation on uses for reclaimed water prevents development of a market which will absorb the total wastewater flow from the bay region.

It should be emphasized that reclamation does not render toxicants harmless. Metals may build up in soils irrigated with wastewater to levels that inhibit plant growth. Toxicants contained in wastewater should be reduced to the lowest practical level before the wastewater is reused. It can be argued, however, that the residual toxicants are best disposed of on land where they are less likely to be reconcentrated through the biological food web than in an estuary.

Control Strategy

Although toxic materials are suspected to be the cause of certain negative characteristics of aquatic life in the bay the evidence is by no means conclusive. In addition, the removal of toxic materials from waste discharges and surface runoff is often difficult and expensive. It appears imprudent to embark on a costly program of toxicant controls in the absence of a good understanding of how toxic materials are affecting aquatic life. The recommended control strategy is to reduce the discharge of toxic substances where this can be done easily and relatively inexpensively. At the same time research will be undertaken to determine whether harmful effects are, indeed, occurring and if further removals are justified.

PREVENTION OF SHELLFISH CONTAMINATION BY BACTERIA

In the latter part of the last century and in the first decades of this one a flourishing shellfishing industry existed in the bay. Presently, although beds of mussels, oysters and clams remain widespread and well-populated, this resource is largely untapped. The shellfish are frequently contaminated and unsafe to eat.

Shellfish are filter-feeders; that is they pump water through their bodies filtering out the plankton and detritus that comprise their diet en route. As a consequence of this feeding method shellfish tend to concentrate within their bodies many of the substances contained in the overlying waters. Pathogenic bacteria and viruses, those that can cause disease in man, accumulate in shellfish if they are present in the overlying waters. The presence of this type of shellfish contamination in the bay is the reason for the prohibition of commercial shellfishing.

The principal sources of pathogenic organisms are municipal sewage discharges, surface runoff, combined sewer overflows and vessel discharges. When the present program of wastewater treatment plant construction is completed, municipal discharges will become an insignificant source of bacteria. The new facilities include effective effluent disinfection systems. Combined sewage overflows, that is overflows from combined sewage and stormwater collection systems during storms, are the subject of on-going control programs in San Francisco and Oakland, the only communities in the region that have them.

Bacteria pollution caused by vessel discharges can be controlled by increasing regulation of this pollutant source. A program of vessel discharge controls is discussed in the subsequent section entitled miscellaneous problems.

Bacterial pollution caused by surface runoff can be reduced by the same types of low-cost control measures as those used to control toxic materials.

MAINTENANCE OF FRESHWATER FLOW INTO THE BAY

Freshwater inflow to San Francisco Bay from the delta has declined since the 1930s as a result of upstream diversions. If presently planned additional diversions are made, freshwater flow will decline still further, as shown in Figure 4. Widespread concern over declining freshwater flows has been expressed. The focus of concern has been the need to maintain minimum flows during dry periods in order to protect migrating fish and to repel salt water. Although this remains a controversial issue it seems reasonable to expect that the responsible agency, the State Water Resources Control Board, will adopt standards which will satisfactorily protect beneficial uses of the bay-delta system. In fact, the existence of dams and reservoirs upstream of the delta allows the release of stored water to maintain minimum flows greater than those experienced under natural conditions.

A second concern is becoming evident. The large winter-time flood flows, often regarded as wasted water, may also be crucial to the health of the bay. Recent experimental work conducted as part of this plan has indicated that increases in delta outflow of at least 10,000 to 15,000 cfs over a period of five to ten days cause salinity changes throughout most of the bay system. These changes persist for many months after the flood; that is parts of the bay remain less salty than the ocean for an extended period of time. There is growing but inconclusive evidence that these salinity changes play a major role in maintaining the estuarine ecosystem.

Increases in delta outflow of the type which cause the salinity changes appear to have occurred in every year for which historical records are available except this year, the driest on record. If no action is taken it is likely that flows sufficiently large to cause major salinity changes will occur much less frequently.

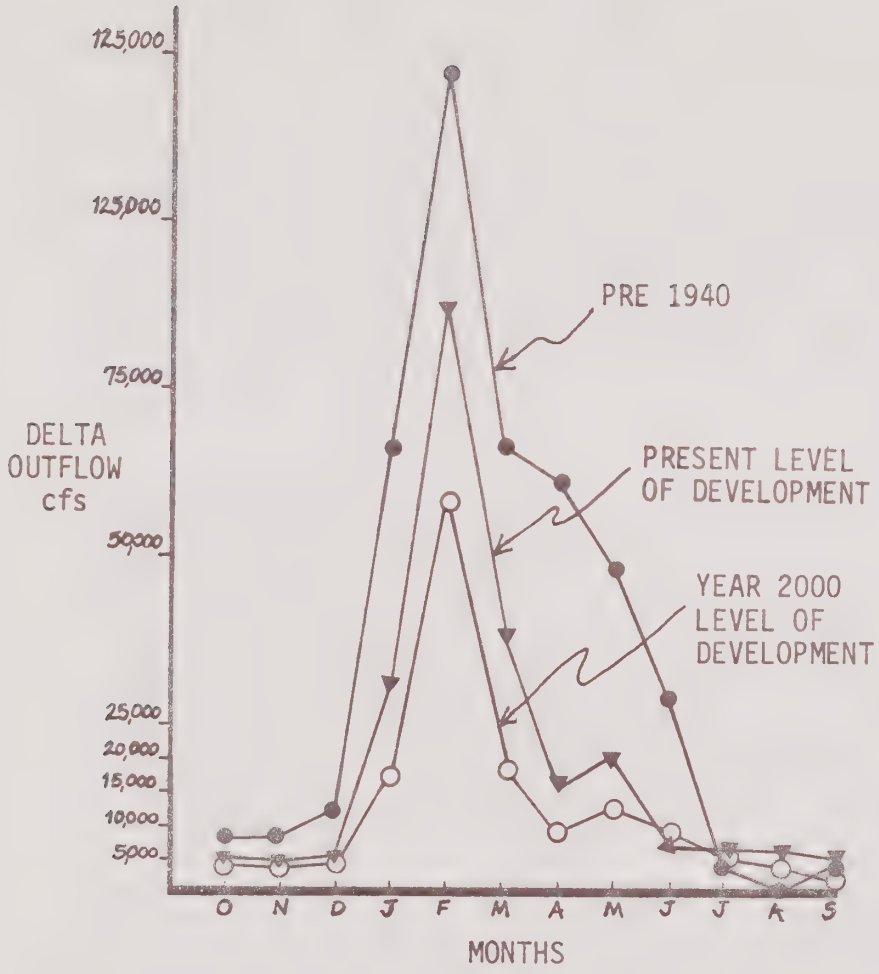


Figure 4.

Trend in delta outflow

The apparent best way to maintain an adequate freshwater flow into the bay system is to ensure that the State Water Resources Control Board adopt standards that require that a certain volume of water be allowed to flow to the bay for the purpose of estuarine protection. Studies will be necessary, however, to determine the volume of water necessary.

PREVENTION AND CLEAN-UP OF OIL AND CHEMICAL SPILLS

Few Bay Area residents could forget the 1971 tanker collision that resulted in almost one million gallons of oil being spilled to the Central Bay. Smaller spills go by unremarked even when their consequences are serious. In a recent nine month period, for example, the California Department of Fish and Game reported 255 accidental spills of oil and chemicals into surface waters in the Bay Area. Forty-two percent were of non-petroleum related chemicals and ranged from milk and wine to herbicides and sulfuric acid in quantities ranging from five gallons to several thousand gallons.

There are many facets to spill prevention and cleanup, only a few of which might be considered problem areas. There are a host of international, Federal, State and local regulations dealing with spill prevention and cleanup. Similarly, there are a large number of agencies involved in these activities. Federal preemption of ocean transportation and petrochemical industry controls has divided regulatory efforts with State and local agencies filling in the gaps. The result is a well intentioned, comprehensive attack on the spill problem which involves a large number of participants and relies heavily on good inter-agency coordination and cooperation. Problem areas and possible corrective actions are difficult to identify because collection of data on spills is so decentralized and each agency tends to concentrate on the circumscribed areas of its own concern. Local agencies such as police and fire departments have no central source to guide their prevention and cleanup efforts. Clearly what is needed is effective monitoring and coordination of all spill prevention and clean-up activities by a single agency. Such an effort would uncover and provide solutions to individual problems that have arisen and will continue to arise in the rapidly changing context of the chemical industry.

Two basic approaches can be used to reduce the risk of accidental oil and chemical spills. One approach is to regulate the construction and operation of vessels and facilities or the installation of safety devices, such as in the proposed Department of Transportation construction standards for oil tankers. The second is to increase limits on the liability incurred by a spiller. This would provide an economic incentive to shippers and facilities for the installation of the latest, most effective safety devices. Personnel training would be improved, countering a frequent cause of spills--operator error.

A singular action that would reduce the risk of major oil tanker accidents would be the installation of a high resolution radar sub-station to cover San Pablo Bay and the Carquinez Straits. These segments of the bay have substantial tanker traffic. In the Central Bay the U.S. Coast Guard provides a comprehensive vessel traffic system composed of traffic lanes, bridge-to-bridge radio communication among ships and high resolution radar, equivalent to an airport's control tower system; this service could readily be extended upstream.

THE SAN JOAQUIN VALLEY AGRICULTURAL DRAIN

The problem of dropping productivity as a result of salt accumulation has plagued irrigated agriculture throughout history. In parts of the San Joaquin Valley the problem is particularly severe because high groundwater levels prevent salts from being leached out of soil. The economic importance of agriculture in the valley, to the state and the nation, is such that a solution is being sought despite the tremendous expense involved.

An exhaustive study of the problem and possible solutions is currently being conducted by the San Joaquin Valley Interagency Drainage Program (IDP). IDP, created in 1975, is a cooperative program sponsored by the U.S. Bureau of Reclamation, the California Department of Water Resources and the California State Water Resources Control Board.

The most obvious solution to the problem is to install subsurface drains to remove excess water and salts from the root zone. The lack of a valleywide management system for collecting and disposing of saline water from individual farms has prevented drain installation from taking place on a scale necessary to solve the problem.

The IDP has evaluated a number of alternatives for disposing of or reusing the water. At present the most promising alternative appears to be construction of a canal which would gather saline water from the subsurface drains and convey it northwards up the valley to a discharge point in Suisun Bay between Antioch and Martinez. The volume of the discharge is expected to increase from 200 mgd in 1990 to 800 mgd in 2060. Principal pollutants contained in the discharge will be salts and nitrogen. The discharge will not contain large quantities of pesticides because these are absorbed by the soil.

If built the drain could have an adverse effect on the San Francsico Bay-Delta system. The apparent best course of action for Bay Area interests is to ensure that discharge requirements are imposed on the drain that adequately protect the beneficial uses of the bay and delta.

OTHER CAUSES OF PROBLEMS

A number of activities cause minor water quality problems - failing septic tank systems, vessel discharges, dredging and mining activities.

Septic Tank and Other On-lot Disposal Systems

Approximately 100,000 or 6-percent of the Bay Area's households are served by on-lot waste disposal systems almost all of which are septic tanks. Although under favorable circumstances septic tanks provide a satisfactory method of waste disposal they often fail to do so for a variety of reasons. Common reasons for failure include inadequate design, poor construction, and inadequate maintenance. In some cases an on-lot disposal system is installed under topographic or soil conditions that will prevent it from functioning properly however well it is designed, built and maintained.

Failing septic tanks can cause water quality problems. Such problems have been reported in the Conn Creek/Lake Hennessey watershed and Edgerly Island in Napa County, North Petaluma Boulevard in Sonoma County, Stinson Beach in Marin County, Emerald Lakes watershed in San Mateo, and the Oakland Hills, Hayward Hills and Livermore area in Alameda County. Two solutions are apparent; the septic tanks could be replaced with a community sewage collection, treatment and disposal system or they could be rebuilt as necessary and properly maintained. The latter option is only available when soils, topography and lot sizes are such that individual on-lot systems can reasonably be expected to work.

In cases where new developments are proposed far from existing sewerage systems, it is necessary to decide whether waste disposal needs should be provided by on-lot systems or whether a sewer system should be built. If it can be demonstrated that on-lot systems will work satisfactorily they should be permitted, provided they are designed and built in accordance with best practices and that they are properly maintained. Public management of the systems would ensure proper maintenance.

Vessel Discharges

In 1975, 4,425 commercial vessels entered the Bay. The U.S. Navy averages 27 ships docked in the Bay at any time and over 111,000 private pleasure craft are registered in the Bay Area. There are 137 harbors and marinas in the area with berthing space for 15,200 private vessels. The potential for sewage pollution from these vessels is large; however, problems have been identified only in certain areas. No problems have been reported for commercial vessels which have holding tanks and discharge at sea while the U.S. Navy will modernize all their vessels to treatment or on-board holding tanks by 1981. Private pleasure craft appear to cause the greatest problem at this time in localized areas such as marinas and relatively enclosed bays. Sources of bacterial pollution are difficult to trace but preliminary analysis indicates that vessel wastes have caused problems in Suisun Bay, Corte Madera Slough, Richardson's Bay, San Rafael Bay and Redwood City Marina.

Private vessels with fixed toilet facilities are subject to new Federal Regulations that require the installation of either holding tanks or flow-through treatment systems, but the Coast Guard has limited means to

enforce the program. There is now a shortage of land based disposal facilities for emptying holding tanks. Flow-through devices have the potential for malfunction or misadjustment. Periodic monitoring of harbors' and marinas' water quality would better define the pollution problem and determine the effectiveness of flow-through devices, but lack of manpower and funds has prevented any agency from conducting such a program. The State Health Department has indicated that only holding tank type devices would provide reasonable protection to shellfish beds from vessel sewage discharges.

Solutions to the vessel waste pollution problems would include increasing the number of shoreside waste handling facilities and improving vessel inspection and water quality monitoring. If water quality monitoring results show a continuing problem, then certain parts of the Bay may need to be declared no-discharge zones.

Dredging

Dredging activities occur throughout San Francisco Bay and the Delta. Most dredging is for periodic maintenance of existing channels required by commercial, military and pleasure craft vessels. Extensive studies have concluded that there is a short term degradation of water quality and destruction of benthic animal life in the immediate vicinity of dredging site. High current velocities in authorized dredge spoil disposal sites prevent buildup of mud that would smother benthic animals. Because the Bay has strong currents and naturally high suspended solids, dredged areas repopulate with new organisms within a few months and organisms outside the working areas do not seem to be adversely affected.

The principal problem with dredging is an unknown. What are the long term subtle effects upon living organisms in the Bay from the release of metals and organic pollutants tied to Bay sediments? No adverse effects are obvious but sufficient research on this problem has not been conducted. A better understanding of the Bay ecosystem is needed to tie together, in cause-and-effect relationships, various biological changes in the Bay such as the decline of the Dungeness crab or fish kills to specific activities of man.

Mining

Mining activities in the Bay include mineral extraction of sand, gravel, crushed stone, oil, gas, geothermal steam, and Bay salt. Mercury and coal were also mined in the past. Federal and State laws regulate mining activities, including waste discharges. None of the mining activities that result in a water-borne pollutant discharge was determined to be a significant source of pollution in the region.

A new state law, the Surface Mining and Reclamation Act, has yet to be tested. In the absence of recent reports of unmitigated mining-caused pollution problems, the new Act should be given an opportunity to work and mining pollution reassessed at a future date.

Chapter—6

Financing and managing water pollution control facilities

This section describes the institutional context within which the plan must be implemented. Agencies with a role in water pollution control are described as are the means of financing construction and operation of facilities.

WATER POLLUTION CONTROL AGENCIES

Operating agencies

Operating agencies are those that own and operate water pollution control facilities. Cities and special districts typically own and operate municipal sewage collection, treatment and disposal facilities. Industrial wastewater facilities are owned and operated by the industries they serve. Individual home or boat owners operate septic tank systems and marine sanitation devices. The operating agencies for most surface runoff controls such as street sweeping are the cities and counties.

Regulatory agencies

Regulatory agencies ensure that the operating agencies perform their function in a satisfactory manner. The most prominent example of a regulatory agency in the water pollution control field is the Regional Water Quality Control Board. In accordance with the provisions of the Porter-Cologne Act the Regional Board issues discharge requirements for all point sources of water pollution. If a discharger violates it's requirements then the Regional Board can impose various sanctions including fines.

Regulation of non-point sources of pollutants is generally more complicated, often involving several different agencies. On the other hand no regulatory agency exists to deal with certain pollutant sources. Different aspects of septic tank systems are regulated by the Regional Water Quality Control Board and the County Health Departments. No agency is currently regulating surface runoff in a comprehensive manner although the Regional Water Quality Control Board has the authority to do so. Operating and regulatory agencies responsible for different pollutant sources are shown in Table 2.

Unresolved issues

The provisions of the Federal Water Pollution Control Act require that management agencies, that is, operating agencies, capable of putting into effect the recommendations of this plan be identified as part of the plan. This is of particular concern with regard to municipal wastewater discharges because after the plan is approved only those agencies identified as management agencies will be eligible to receive federal grants.

Table—2.

Operating and regulatory agencies

Pollutant Source	Operating Agency	Regulatory Agency
Municipal sewage	Cities and special districts	Regional Water Quality Control Board, EPA
Industrial wastewater	Private companies	Regional Water Quality Control Board, EPA, cities and special districts
On-lot disposal systems (incl. septic tanks)	Homeowners	County Health Departments Regional Water Quality Control Board, City and County Building Departments
Vessel wastes	Ship and boat owners	U.S. Coast Guard, County Health Department State Health Department State Water Resources Control Board S.F. Bay Conservation and Development Commission
Dredging	U.S. Army Corps of Engineers Private contractors	U.S. Army Corps of Engineers EPA U.S. Fish and Wildlife Service State Lands Commission S.F. Bay Conservation and Development Commission State Water Resources Control Board
Mining activities	Mine operators/owners Local governments	EPA Regional Water Quality Control Board Cities and Counties
Oil & Chemical Spills	Ship, truck and factory operators CALTRANS Private cleanup contractors Department of Fish and Game California Office of Emergency Services U.S. Coast Guard	United States Coast Guard Environmental Protection Agency U.S. Department of Transportation California Office of Emergency Services California Department of Fish and Game California Highway Patrol Regional Water Quality Control Board, S.F. Bay Region State Water Resources Control Board

Experience has shown that large operating agencies are usually better managed than smaller ones. Economies of scale are possible and larger operating budgets allow the employment of better qualified staff. In addition, the existence of large operating agencies could lead to consolidation of treatment facilities which may be desirable in the long run.

It has not been possible, as part of this study, to analyse the performance of the operating agencies and decide which types of agencies are most effective. Consequently it would be premature to designate management agencies at this time. A two-phase approach to resolution of this issue is proposed. Discussions with the existing sub-regional agencies have been initiated; the results of the discussions will be included in the integrated EMP. A more detailed analysis of the effectiveness of different agencies leading to designation of management agencies will be undertaken as part of the continuing planning process.

FINANCING WATER POLLUTION CONTROL FACILITIES

Municipal Facilities

Municipal wastewater facilities are the sewers, pipelines, treatment plants and outfalls required to safely dispose of wastewater from homes and businesses.

Grants are available from the State and Federal governments to help municipalities pay for construction of wastewater facilities. Until recently, and possibly in the future, the State and Federal governments will pay up to 12 1/2-percent and 75 percent of the cost of construction respectively. The local share of the construction cost together with the cost of operation and maintenance must be financed by user charges. User charges are fees charged homeowners and businesses for use of the sewer system. For commercial and industrial-users they are based on the volume and strength of the waste discharged to the system. Residential users often pay a connection charge and flat fee for service.

Industrial users of municipal systems are required to pay back that portion of the federal grant associated with the capital cost of the capacity they use.

Industrial Facilities

Industrial wastewater facilities are paid for by individual private companies. Tax laws allow industry to reduce its tax burden by granting tax credits for investment in pollution control and by allowing rapid depreciation of pollution control facilities. The Small Business Administration and California Pollution Control Financing Authority provide businesses with low-interest loans for pollution control equipment.

Financing Problems

Few serious problems have been encountered in financing the present expansion of municipal and industrial wastewater treatment. With a few exceptions cities and special districts have successfully sought voter approval for sale of bonds to finance the local share of municipal facilities costs. Few revenue programs which specify the user charges that are necessary to pay for the new facilities have come into effect, however. Most homeowners and businesses have yet to feel the full effect of increased costs for sewage disposal. Once these charges are in effect there may be a reduced voter readiness to approve new bond issues.

It is difficult to predict how much longer 87 1/2 percent grants for wastewater facilities construction will be available. Continuation of 12 1/2 percent state funding is dependent on statewide voter approval of a bond issue in 1978. The present federal 75 percent funding may be reduced as part of the amendments to the Federal Water Pollution Control Act being considered by Congress at the present time.

Chapter—7

The plan

The recommended water quality management plan consists of an overall water quality management strategy divided into five control elements or action plans. The overall strategy consists of a list of planning principles or policies that will guide water quality management actions in the future. This strategy ensures that effort and funds are expended on those controls that result in the greatest environmental benefit at the least social and monetary cost. Within the five action plans, individual policies are accompanied by a set of implementing actions which describe how water quality in general should be managed and how municipal discharges, industrial discharges, surface runoff and a number of miscellaneous sources of pollutants can be controlled.

Table 3 lists the plan recommendations. The policies that comprise the water quality management strategy and their implementing actions are listed in the first column headed recommendations. For each action subsequent columns of the table show the agencies responsible for implementing the action, implementation schedule, legal authority of agency to implement the action, cost, source of funding, measures to ensure implementation and the environmental, institutional/financial, economic and social impacts of the action.

The purpose of the following narrative is to serve as an aid to understanding the contents of the table.

WATER QUALITY MANAGEMENT ELEMENT

Policy. Establish continuing planning process for water quality management.

The water quality objectives for the region are the keystone of water quality management. They are not unchanging, however. Changes may be necessary for several reasons. New information on the effects of pollutants on the waters of the region may allow the existing objectives to be refined or may require that new objectives be added to protect against presently unforeseen threats to water quality. It may be necessary to revise the objectives to make them consistent with other regional goals. Likewise it may be necessary to modify the existing implementation plan to meet the changed objectives.

Actions

As an initial step the adoption of amended water quality objectives for the region is recommended. These objectives are identical to those presently adopted with the exception that objectives for delta outflow will be included in the final EMP. The objectives for the delta are designed to ensure that sufficient freshwater flow enters the bay to maintain the estuarine ecosystem. They have been the subject of public hearings held recently by the State Water Resources Control Board. Objectives together with the beneficial uses they protect are shown in Appendix A.

Updating of this plan at two year intervals is recommended. Plan revisions will be prepared by ABAG staff in consultation with the Regional Water Quality Control Board. Between formal plan updates, interim changes can be made based on Regional Board and EMTF approval only.

Policy. Improve understanding of the Bay-Delta system and the fate and effects of pollutants entering it.

When most pollution control actions were directed at the most obvious pollution problems, understanding of the bay system was not an essential prerequisite to action. Now that the more subtle or insidious effects are to be tackled, a good understanding of the bay system is imperative. This is of particular importance with regard to the need or otherwise for programs of strict surface runoff controls and pretreatment of industrial wastes discharged to the municipal sewer.

Actions

The establishment of a San Francisco Bay Delta Research Program (SFBDRP) is recommended. SFBDRP would have two principal purposes: the conduct of goal-oriented research programs designed to answer those questions crucial to the refinement of water quality objectives that will protect the bay and the monitoring of the bay to determine the effectiveness of existing pollution control programs. Early research goals of the program will be development of improved requirements for toxic discharges and delta outflow quality and quantity.

Although millions of dollars are spent each year on monitoring the bay by numerous organizations, there is no established procedure for coordinating monitoring programs or translating monitoring results into action. At the present time dischargers are required to conduct self-monitoring programs to monitor the performance of their treatment plants and to monitor the response of the environment to their discharges. The recommended action would transfer responsibility for the latter to the SFBDRP. The action will result in several significant advantages. Monitoring and analysis of samples would be conducted by a full-time staff of technical specialists rather than as an occasional task performed by consultants or discharger's staff with other prime responsibilities. Thus, results will be more accurate and credible and will provide a sounder basis for revising water quality objectives. In addition, the monitoring program can be designed as an integrated whole and effort can be focused more readily on those areas or problems of most concern.

Actions are also recommended to improve the management of data gathered and make it more accessible to concerned citizens or other users. Annual reports will be prepared, summarizing research and monitoring results, which will serve as an input to the plan updating process.

The activities of SFBDRP will be directed by a governing body containing representatives of the dischargers and agencies concerned with protection of water quality and aquatic life.

Policy. Ensure that water pollution control facilities or measures effectively protect water quality.

When the present program of treatment plant construction is completed, the emphasis in water quality management will shift from construction to operation.

If the investment in pollution control facilities or measures is to be worthwhile, they must do the job they were designed for. In addition, we must ensure that water quality is indeed protected.

Actions

The actions recommended to effect this policy are of two types; monitoring actions and information-sharing actions. As at present the Regional Water Quality Control Board will require that municipal and industrial dischargers monitor the quality of their effluent. The response of the environment to the discharge will be monitored by SFBDRP. The actions necessary to ensure that surface runoff controls are effective will be described in the individual county surface runoff plans.

The information-sharing actions include coordination of treatment plant and other operating personnel training programs and establishment of a clearinghouse for technical exchanges, personnel needs, etc.

MUNICIPAL FACILITIES ELEMENT

Policy. Provide facilities needed for municipal sewerage service and water quality protection.

Municipal wastewater facilities should be provided to dispose of wastewater from homes and businesses without posing a threat to public health, welfare or the environment. Facilities should be sized to serve that level of growth consistent with regional goals.

Actions

The construction of new or the expansion of existing wastewater facilities necessary to further the above policy is recommended. The facilities needed over the next 20 years are shown in Appendix B. The treatment levels required before discharge are the same as those currently required by State and Federal law; these levels of treatment adequately protect the receiving waters. Discharges will continue to be regulated using the National Pollutant Discharge Elimination System (NPDES) or permit program administered by the Regional Water Quality Control Board. Discharge permit conditions will be consistent with the EMP.

Every year the twenty-year list of needed facilities will be updated by ABAG in consultation with the dischargers and the Regional Water Quality Control Board.

An undetermined percentage of the capital cost of facility construction will be supported by State and Federal grants.

Policy. Encourage consolidation of treatment facilities and discharge of wastewater to well-mixed areas of the receiving waters.

Most of the decisions affecting the consolidation of treatment facilities and the location of discharge sites have been made. A major factor in these earlier decisions was the desire to maximize the use of existing facilities. As facilities wear out and need to be replaced or modified the earlier decisions must be re-examined. Opportunities to move discharges to less environmentally sensitive areas and to consolidate treatment should be taken. Consolidation of treatment facilities can save money and usually leads to better operational reliability.

Action

All plans for proposed new facilities or facilities modifications will be reviewed for consistency with the above policy. Projects determined to be inconsistent will not be included on the twenty-year project list and thus will not be eligible for State and Federal grants.

Policy. Accelerate progress toward wastewater reclamation and reuse.

Actions to implement this policy are described in the Water Conservation, Reuse and Supply Management Plan.

SURFACE RUNOFF ELEMENT

Policy. Establish a program of surface runoff controls that emphasizes low-cost measures to reduce the pollutant load from this source.

As has been noted earlier, evidence exists that toxic materials may be adversely affecting aquatic life. A substantial portion of the toxic material is contained in surface runoff. Because the evidence of harmful effects is inconclusive, a heavy investment in surface runoff controls is not justified at this time. However, a uniform minimal level of control requiring little investment of funds and representing no more than good urban "housekeeping" (best management practices) is recommended. The actions needed to further this policy will be contained in the individual county surface runoff plans.

INDUSTRIAL FACILITIES ELEMENT

Policy. Provide facilities needed for industrial wastewater treatment and water quality protection.

Industrial wastewater facilities should be provided to dispose wastewater from industries without posing a threat to public health or welfare, the environment, or in the case of indirect dischargers, to the municipal sewerage system.

Actions

The construction of new or expanded industrial wastewater facilities necessary to further the above policy is recommended. A list of direct industrial dischargers and discussion of the treatment levels they must attain is included in Appendix C. The treatment levels required before direct discharge to the environment are the same as those currently required by State and Federal law; these levels of treatment adequately protect the receiving waters. Direct discharges will continue to be regulated using the National Pollutant Discharge Elimination System (NPDES) permit program administered by the Regional Water Quality Control Board. Discharge permit conditions will be consistent with the EMP.

The cost of facilities will be borne by private companies. Low interest rate loans for the cost of construction of pollution control facilities are available to industry.

Industrial dischargers to municipal wastewater systems will be required to pretreat their waste to that degree necessary to allow the municipal plant to meet its discharge requirements and to prevent interference with the treatment processes. Sewerage agencies will be reponsible for administering the necessary pretreatment or source control programs. It should be noted that federal regulations on pretreatment are expected to be finalized later this year. Depending on the nature of the regulations the plan may have to be adjusted.

MISCELLANEOUS SOURCES ELEMENT

Policy. Improve wastewater disposal practices in unsewered areas.

For many years, the trend has been away from on-lot disposal systems such as septic tanks. In general, this has been a favorable trend because, in most cases, community-owned sewage collection, treatment and disposal facilities provide a safer and more reliable alternative to on-lot systems. Exceptions to this general rule may exist in the more rural parts of the region. The purpose of the policy is to ensure that where on-lot systems are determined to be the most appropriate waste disposal system, they are designed, constructed and maintained in a manner that protects the public health and water quality.

Actions

It is recommended that: the Regional Water Quality Control Board, in conjunction with County Health Departments, would establish minimum, regionwide guidelines for the selection, evaluation, design and construction of on-site disposal systems, incorporating the latest scientific information on the subject. Local city and county governments would incorporate these guidelines into their building codes. Those counties which incorporate such standards would be exempt from RWQCB Waste Discharge requirements for the individual on-site systems.

For new housing developments which could use on-site disposal systems (where those systems are technically appropriate), public management of those systems would be required. For existing housing developments having sewerage problems which could be eliminated by proper maintenance of on-site systems, public management would be a permitted option. Public management could be by existing agencies or new and could perform a range of tasks including monitoring, service and repair. Public management eliminates only maintenance-related failures and does not advocate inappropriate location of on-site disposal systems. Where on-site systems are technically or economically inappropriate or do not conform to local land use plan requirements, then sewerage systems should be installed.

In recognition of the desirability of the proposed actions developed for the EMP, the RWQCB on 19 August, 1977 issued proposed policy statements that would lead to the adoption of updated design criteria and public maintenance of new on-site disposal systems.

Policy. Improve coordination and performance of agencies in preventing and dealing with oil and chemical spills.

Responsibility for prevention and clean-up of oil and chemical spills is shared by many agencies. Each agency deals with part of the problem and most claim insufficient funds and manpower to do a thorough job. Because of the division of responsibility it is difficult for policy makers and the public at large to determine whether present practices are effective.

Actions

The key action is designation of a single agency to provide an overview of existing practices. This agency would monitor the performance of all other agencies dealing with spill prevention and clean-up. An annual report to the EPA Administrator and the Governor would be prepared identifying any problems with existing practices. The agency could act as coordinator for the other agencies dealing with spills if this was determined to be necessary.

Another action recommends the U.S. Coast Guard restudy the possibility of extending high-resolution radar coverage north of the Richmond-San Rafael Bridge as a way of further reducing the possibility of tanker accidents.

The enactment of federal laws requiring improvements in the standard of construction for tankers is also recommended.

Policy. Reduce sewage pollution from small boats in marinas, harbors and environmentally-sensitive areas.

The discharge of raw or poorly treated sewage from small boats causes violations of water quality standards in marinas and harbors. The effects of vessel discharges in open waters are too slight to be detected. However, sewage from vessels can contaminate shellfish beds which is one reason why commercial shellfish harvesting is not permitted in San Francisco Bay.

Actions

Pollution caused by vessels does not appear to be one of the regions more serious environmental problems. Consequently, the main thrust of the recommended actions is enforcement of existing or slightly amended regulations and public education rather than drafting of new regulations. If in the future, these actions fail to solve the problem, or if new information shows the problem to be more serious than presently supposed, then it may be necessary to take stronger action such as prohibiting any vessel discharges in certain parts of the Bay.

The construction of holding tank pump-out facilities at all marinas and harbors is recommended. A public information program should be initiated to increase boat owners' awareness of problems caused by vessel discharges and the devices available for solving the problem. Boat owners installing flow-through waste treatment type devices should be made aware that possible future regulations could require their replacement with holding tank devices. Water quality monitoring in areas frequented by small boats should be intensified in order to determine the effectiveness of control measures. Although no water quality problems associated with commercial vessels have been identified to date, the monitoring program will be designed to identify such problems if they do, in fact, exist.

ASSOCIATION OF BAY AREA GOVERNMENTS
ABAG

ENVIRONMENTAL MANAGEMENT PROGRAM

October 18, 1977

TO: Miscellaneous Sources Advisory Committee

FM: Terry Bursztynsky TAB

RE: Draft Water Quality Management Plan

The attached Draft Water Quality Management Plan is being sent to you for your review and comment. This plan has combined elements of the Municipal and Industrial Discharge Plan, Water Quality Special Studies results, and the Miscellaneous Sources of Water Pollution Management Plan. Only the Groundwater Protection Plan is not included, and it will be presented with the Water Conservation, Reuse and Supply Plan at a later date.

Please review this plan carefully. Due to time constraints we will not have an opportunity for a formal Advisory Committee meeting before the presentation of the plan to the EMTF on 9 November 1977. Please submit any comments to me in writing or by telephone at 841-9730 by 4 November 1977. If the response supports it, we will have an Advisory Committee meeting after 9 November.

THANK YOU FOR YOUR HELP.

Table—3.

Plan recommendations

Water quality management plan recommendations

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL * COST/YEAR OF RECOMMENDED ACTION	PORTION OF * TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—1 IMPROVE UNDERSTANDING OF BAY SYSTEM AND THE FATE AND EFFECTS OF POLLUTANTS ENTERING IT.								
Action 1.1 Establish San Francisco Bay Delta Research Program (SFBDRP).	The effectiveness of pollution control actions is impaired by our limited knowledge of the ways in which bay waters and aquatic life are affected by pollutants. The recommended program will provide further information on the pollution cause and effect relationship and translate information into better standards for water quality protection. Monitoring and analysis will be centralized with a consequent saving in cost and an improvement in accuracy. Annual reports in pollution control will keep the public informed about the state of the bay.	ABAG in consultation with all affected parties.	August, 1978.	Joint Powers Agreement of dischargers and affected agencies.	$185,000 (includes 1.1, 1.2, 1.4)	$185,000 (includes 1.1, 1.2, 1.4)	State and EPA grants and fees from dischargers.	Voluntary.
Action 1.2 Establish research goals.		SFBDRP and RWQCB.	December, 1978.		Included in 1.1	Included in 1.1		
Action 1.3 Conduct research.		SFBDRP.	On-going.		$1,800,000	$1,800,000	State and EPA grants.	

* This column presents annualized costs. The annualized cost is the amount of money per year that would amortize the total cost of the program over the period 1978-2000 at a 6-3/8% interest rate.

Caltrans = California Department of Transportation; ABAG = Association of Bay Area Governments EPA = Environmental Protection Agency;

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o No impacts. Water Quality o Indirectly improves water quality - provides data to make informed decisions. Physical Resources o Indirectly benefits physical resources as water quality is improved. Energy o No impacts. Amenities o Indirectly affects amenities - highly dependent on nature of actions taken as a result of monitoring data.	Financial o Research program would require equipment, housing, personnel and operating funds. o Costs would be met by participants; dischargers, counties, RWQCB, SWRCB, and EPA. Institutional o Would centralize responsibilities for S.F. Bay Delta research and monitoring. o Would result in higher level of cooperation among agencies and dischargers. o Would improve accuracy and credibility of research and monitoring results. *IMPACTS NOTED FOR THE POLICY ARE COMMON TO ALL ACTIONS	Production of Goods and Services o Employment - would create employment for approximately 30 persons in all phases of program. Income and Investment o Will require capital investment for research sampling and analytical facilities. Consumer Expenditures o No impact.	Housing Supply o No impacts. Physical Mobility o No impacts. Health and Safety o Indirectly would affect decisions on water quality that affect health. o Directly might uncover health and safety problems as a result of research or monitoring. Sense of Community o No impact. Urban Patterns and Land Use o No impact. Equity o No impact.
Impacts same as noted for Policy 1.	Financial Direct Public Cost of Implementation o (1978) $100,000 (first-year administrative costs) o (1979-2000) $192,000/year (Administrative and management costs-actions 1.1, 1.2, and 1.4). Other institutional impacts are the same as noted for Policy 1	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.
Impacts same as noted for Policy 1.	Impacts same as noted for Action 1.1.	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.
Impacts same as noted for Policy 1.	Financial Direct Public Cost of Implementation o (1979-2000) $2,000,000/year (estimate of research program costs) o Costs would be borne by State and Federal grants. Other institutional impacts are the same as noted for Policy 1.	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.

SWRCB = State Water Resources Control Board RWQCB = Regional Water Quality Control Board

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 1.4 Establish regionwide monitoring program.		SFBDRP and RWQCB in consultation.	December, 1978.	Porter-Cologne Act.	Included in 1.1	Included in 1.1		
Action 1.5 Conduct receiving water monitoring.		SFBDRP.	On-going.	Porter-Cologne Act.	$1,700,000	$1,700,000	Fees from dischargers.	
Action 1.6 Publish annual "state of the waters" report.		SFBDRP.	August, 1979 and annually thereafter.		$32,000	$32,000	State and EPA grants and fees from dischargers.	
Action 1.7 Establish regionwide water quality data management system.		ABAG.	December, 1978.		$19,000	$19,000	State and EPA grants, ABAG membership dues.	

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 1.	Impacts same as noted for Action 1.1	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.
Impacts same as noted for Policy 1.	Financial Direct Public Cost of Implementation o (1980-2000) $2,000,000/year (estimate of total Bay Area monitoring costs). o Costs to be borne by fees from dischargers. Other institutional impacts are the same as noted for Policy 1.	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.
Impacts same as noted for Policy 1.	Financial Direct Public Cost of Implementation o (1979-2000) $35,000/year (labor and materials for report production). Institutional o Would provide means of publically disseminating monitoring program results. o Would provide mechanism for communication with public. o Would provide foundation of public support for regulatory actions.	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.
Impacts same as noted for Policy 1.	Financial Direct Public Cost of Implementation o (1979) $10,000 (development of computer data management program (1979-2000) $19,500/year (supply data to computer and provide information retrieval). Other institutional impacts are the same as noted for Policy 1.	Impacts same as noted for Policy 1.	Impacts same as noted for Policy 1.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TCYA COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—2								
ESTABLISH CONTINUING PLANNING PROCESS FOR WATER QUALITY MANAGEMENT.								
Action 2.1								
Establish water quality objectives for waters of the region.	Water quality objectives designed to protect beneficial uses are the foundation of the water quality management plan. Beneficial use designations and water quality objectives for the region are shown in Appendix A. The objectives are similar but not identical to current objectives.	ABAG & RWQCB.	August, 1978.	Federal Water Pollution Control Act & Porter-Cologne Act.	-0-	-0-		State & EPA review.
Action 2.2								
Update water quality management plan in conformance with other environmental goals.	As the population grows and information on pollutant effects and the effectiveness of control measures accumulates, the plan must be updated.	ABAG & RWQCB.	Every two years after August, 1978.	Federal Water Pollution Control Act & Porter-Cologne Act.	$46,000	$46,000	State appropriation and EPA grants.	State & EPA review.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o May indirectly assist when water quality plans coordinate with and enforce air quality protection plans. Water Quality o Indirect improvement in water quality when plans are later implemented. o Benefits from waste discharge restrictions featured in objectives. Physical Resources o Indirect benefits to aquatic resources from improved water quality. o Indirect improvements on recreational water uses from improved water quality. Energy o Indirectly increased energy use for treatment plant construction and operation would result. Amenities o Indirect improvement for sites with water-related significance.	Institutional o Directly would require involvement of and work from public agencies. o Indirectly would improve public sewage services. [illegible] o Direct costs of producing plans. o Indirect costs of implementing plans. o Planning would produce direct benefit of maximizing Federal/State funding.	Production of Goods and Services o Employment - employment increase to produce plans. o Indirect employment increases in some areas to meet plan requirements. o Possible loss of employment in areas unable to meet objectives. o Possible reduction of production in areas unable to meet objectives. Income and Investment o Indirectly decreased profits or increased costs of goods and services from regulated industries. o Indirectly increased profits for some construction and material supply firms. o Indirectly increased competition for borrowed funds. o Indirect increase in capital investment. Consumer Expenditures o Indirectly increased prices of goods from regulated industries. o Some requirements for consumers to purchase pollution control equipment.	Housing Supply o Indirect potential influence on localized housing supply. Physical Mobility o Indirect short-term effects from sewer and treatment facility construction. Health and Safety o Indirect health benefits from improved water quality. Sense of Community o Indirectly may cause changes in nature of some communities by affecting utilities and land use. Urban Pattern and Land Use o Indirectly may affect land use in some communities by allowing or restricting sewerage service. Equity o Would affect population groups differently, generally by communities.
Air Quality o No impact. Other environmental impacts are the same as noted for Policy 2.	Impacts same as noted for Policy 2.	Impacts same as noted for Policy 2.	Impacts same as noted for Policy 2.
Impacts same as noted for Policy 2.	Financial Direct Public Cost of Implementation o (1979-2000) $50,000/year (direct staff cost to ABAG). Other institutional impacts are the same as noted for Policy 2.	Impacts same as noted for Policy 2.	Impacts same as noted for Policy 2.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—3 ENSURE THAT WATER POLLUTION FACILITIES OR MEASURES EFFECTIVELY PROTECT WATER QUALITY.								
Action 3.1 Issue and update monitoring requirements appropriate to permit conditions and in conformance with region-wide monitoring network.	As the program of treatment plant construction winds down the emphasis in water pollution control will shift from construction to operation and monitoring.	RWQCB.	Continuous.	Porter-Cologne Act.	$160,000	-0-	State appropriation.	EPA review.
Action 3.2 Monitor performance of municipal and industrial wastewater systems in accordance with monitoring requirements.		Sewerage agencies and individual private companies.	Continuous.		Undetermined	-0-	Local and private funds.	RWQCB review.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o No impact. Water Quality o Will maintain receiving water quality by ensuring highest possible quality of treatment plant discharge. Physical Resources o Will indirectly protect marine and shoreside resources by helping to maintain water quality. Energy o No impacts. Amenities o No impacts.	Financial o Refer to actions below. Institutional o Would directly ensure that sewerage service agency or industry is protecting water quality.	Production of Goods and Services o Minor employment increase. Income and Investment o Wages would be paid to persons implementing this policy. Consumer Expenditures o Refer to actions below.	Housing Supply o No impact. Physical Mobility o No impact. Health and Safety o Will assure protection of public health through proper operation and performance of facilities. Sense of Community o No impact. Urban Pattern/Land Use o No impact. Equity o No impact.
Impacts same as noted for Policy 3.	Financial Direct Public Cost of Implementation o (1978-2000) $160,000/year (personel costs for setting monitoring requirements). Other institutional impacts are the same as noted for Policy 3.	Production of Goods and Services o Minor employment increase for agency. Income and Investment o Same as Policy 3. Consumer Expenditures o Consumers would indirectly support agency through existing tax structure.	Impacts same as noted for Policy 3.
Impacts same as noted for Policy 3.	Financial Direct Public Cost of Implementation o (1978-2000) $182,700/year (cost to RWQCB for monitoring program). o Unknown costs for agencies. o Direct costs of laboratory and sampling equipment to be borne by discharger. o Costs will depend upon specific monitoring requirements. o Personnel costs to be incurred by dischargers. Other institutional impacts are the same as noted for Policy 3.	Production of Goods and Services o Employment increase for dischargers--minor per discharger. Income and Investment o Dischargers would pay wages to samplers and laboratory personnel. Consumer Expenditures Direct Private Cost of Implementation o Unknown to private companies. o Consumers would directly support public service agency through payment of fees. o Consumers would indirectly support industries' costs through costs of goods and services.	Impacts same as noted for Policy 3.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 3.3 Publish annual report summarizing results of dischargers self-monitoring programs.		RWQCB in cooperation with SFBDRP.	Annually.		$32,000	$32,000	State	
Action 3.4 Coordinate wastewater treatment plant operator training programs.		ABAG.	Continuous.		$29,000	$29,000	Fees and possible federal grants.	
Action 3.5 Establish technical assistance program/information clearinghouse for wastewater system operations.	This program would provide treatment plant operators with an organization to call for technical assistance, location of spares, emergency assistance, etc.	ABAG.	Continuous.		$40,000	$40,000	ABAG dues if special districts become eligible for membership.	

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Water Quality o No impacts. Physical Resources o No impacts. Other environmental impacts are the same as noted for Policy 3.	Financial Direct Public Costs of Implementation o (1979-2000) $35,000/year (labor and materials for report production). Institutional o Would provide means of disseminating monitoring program results. o Would provide mechanism of communication with public. Other institutional impacts are the same as noted for Policy 3.	Impacts same as noted for Action 3.1.	Health and Safety o No impact. Other social impacts are the same as noted for Policy 3.
Impacts same as noted for Policy 3.	Financial Direct Public Costs of Implementation o (1978) $12,500, (1979-2000) $30,000/year (personnel costs to ABAG). Institutional o Would place new obligations of manpower and materials upon ABAG.	Impacts same as noted for Action 3.1.	Equity o Would directly benefit specific economic group-wastewater treatment operators. Other social impacts are the same as noted for Policy 3.
Impacts same as noted for Policy 3.	Financial Direct Costs of Implementation o (mid 1978-2000) $42,000/year (personnel costs to ABAG) Other institutional impacts are the same as noted for Action 3.4.	Impacts same as noted for Action 3.1.	Impacts same as noted for Policy 3.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION -	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—4								
PROVIDE FACILITIES NEEDED FOR MUNICIPAL SEWERAGE SERVICE AND WATER QUALITY PROTECTION.								
Action 4.1 Expand existing and provide new facilities for municipal sewage collection, treatment and disposal.	Existing sewerage service facilities must be expanded to service the needs of growing communities. Needed facilities are shown in the 20 year project list contained in Appendix B.	Sewerage agencies.	See Appendix B.	Enabling legislation for cities and special districts.	$230,000,000	-0-	Federal & State grants + user charges + assessments.	RWQCB can impose sanctions for non-compliance with permit conditions.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o Temporary dust problems during facility construction. o Poorly designed or operated facilities may cause local odor problems. o Indirectly may affect air quality by permitting development to occur. Presumably offset by Action 2.2. Water Quality o At minimum would result in removal of suspended solids, some toxicants, some nutrients, most bacteria and most oxygen demanding substances. o Advanced treatment plants would provide high bacteria and virus removal, nutrient removal and/or reduction of toxicants and resistant organic compounds. Physical Resources o Indirectly benefits marine resources as water quality is protected. o Will add sewage solids to solid waste disposal problem. o Consumes construction materials. Energy o Consumes electricity, gas and diesel fuel during construction. o Commits to energy use for treatment plant operation. o Advanced physical-chemical plants consume even more energy. Amenities o Local, possibly negative visual, odor and noise problems of facility design and operation can be mitigated. o Temporary and local traffic, noise and dust problems from construction activities.	Financial Direct Public Cost of Implementation o Capital (20 year construction estimate) $2.4 billion. o Operation and maintenance estimate $122 million/year in 1995. Fiscal Effects on Local Governments o Local governments and agencies will have to finance local share of construction at a minimum of 12.5%. o Local agencies must finance total cost of operation and maintenance. o Actual fiscal impacts depend upon choice of financing mechanisms. o Indirect fiscal impacts will result from public services to new growth (fire, schools, etc.). Institutional o Will require growth of agencies to provide sewerage services. o Indirectly will accommodate urban growth that will require increased general services. o Will enable local governments to meet obligations of State and Federal laws.	Production of Goods and Services o Employment - direct increase in construction fields; direct increase in treatment plant operator jobs--indirect increase associated with general economic growth. o Would permit influx of industrial/commercial businesses that would use municipal sewers. o In some cases would permit industry to stay rather than be closed by stringent direct discharge requirements. Income and Investment o Indirect increase in plant operators and construction workers wages. o Requires substantial capital investment for facilities. o Facility construction will compete for funds on money markets. Consumer Expenditures o Increased costs to consumers for sewage connection and service. o Operation and maintenance costs are totally borne by users.	Housing Supply o May stimulate housing starts in areas where lack of sewerage service was a limiting factor. o Availability of sewerage service is one tool for control of suburban housing development. Physical Mobility o No impacts. Health and Safety o Reduced health risks should result where discharges of poorly treated wastes are eliminated. Sense of Community o Indirectly improves community by adding more complete services. o Provision of sewer service tends to change rural communities to urban/suburban. Urban Pattern/Land Use o Availability of sewerage service encourages infilling and urban development. Equity o Sewer service charges are based upon use--not ability to pay. o User charges and connection fees differentially impact low, moderate and high income households.
Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 4.2 Issue and update limits for municipal discharges in conformance with EMP.		RWQCB.	Continuous.	Federal Water Pollution Control Act Amendments.	$94,000	-0-	State appropriation.	EPA review.
Action 4.3 Update twenty-year project list consistent with other elements of EMP.		ABAG & RWQCB.	Annually.	Federal Water Pollution Control Act Amendments.	$7,000	$7,000	State appropriation & EPA grants.	EPA review.
Policy—5 ENCOURAGE CONSOLIDATION OF TREATMENT FACILITIES AND DISCHARGE OF WASTEWATER TO WELL-MIXED AREAS OF THE RECEIVING WATERS.								
Action 5.1 Review all proposed facilities for consistency with above policy.	Decisions regarding configurations of treatment and disposal facilities have been influenced by the desire to maximize use of existing facilities. As facilities wear out, earlier decisions must be re-examined to ensure that replacement is done in the most cost-effective manner.	ABAG.	Continuous.	Federal Water Pollution Control Act Amendments.	$4,000	$4,000	State appropriation & EPA grants.	ABAG. Facilities must be consistent with plan to be grant eligible.
Policy—6 ACCELERATE PROGRAMS TOWARD RECLAMATION AND REUSE OF WASTEWATERS. (see Water Conservation, Reuse and Supply Plan)								
Policy—7 ESTABLISH A PROGRAM OF SURFACE RUNOFF CONTROLS BASED ON A UNIFORM, MAXIMUM LEVEL OF CONTROL DESCRIBED AS "BEST MANAGEMENT PRACTICES." All actions under this policy will be described in the county surface runoff plans.								

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.
Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.	Impacts same as noted for Policy 4.
Air Quality o No impacts. Water Quality o May improve plant reliability and water quality if inefficient small plants eliminated. o May improve local water quality if discharges to poorly mixed waters eliminated. Physical Resources o May improve marine or water oriented resources if water quality is improved. o Might lead to greater use of construction resources than alternative plan--or, depending upon plan, may save resources. Energy o Could require energy to move sewage to new treatment locations but may save some energy in treatment. Amenities o No impact.	Financial o Would directly determine grant eligibility of proposed alternative. Would eliminate grant funding for non-approved projects. May produce economies of scale in consolidation of facilities. Would broaden service area and financial base for single facility. Institutional o May eliminate or require consolidation of some sewage treatment agencies. At times will require plans of low institutional acceptability--resulting in resistance. Would require high level of technical staffing at ABAG. Provides enforcement for regional policy.	Production of Goods and Services Employment - one large facility and service agency may require fewer employees than two component facilities/agencies. Change in construction employment for new construction vs. renovation is indeterminable. Income and Investment Impacts will depend upon specific situation. Consumer Expenditures o Savings to consumers for sewerage services will depend upon specific situation.	Housing Supply o No impact. Physical Mobility o No impact. Health and Safety o May reduce water borne health risks if poorly located facilities are removed. Sense of Community o No impact. Urban Pattern/Land Use o No impact. Equity o No impact.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—8								
PROVIDE FACILITIES NEEDED FOR INDUSTRIAL WASTEWATER TREATMENT AND DISPOSAL AND WATER QUALITY PROTECTION.								
Action 8.1 Expand existing and provide new facilities for treatment and disposal of industrial wastes discharged directly to the environment.	Facilities needed are described in Appendix C.	Individual private companies.	See Appendix C.		$25,000,000	-0-	Private funds. Low-interest rate loans available authorized by California Pollution Control Financing Act.	RWQCB can impose sanctions for non-compliance with permit conditions.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o No impacts. Water Quality o Receiving waters would have lowered levels of pollutants such as: ammonia, bacteria, phosphorus, toxic organic compounds and heavy metals. o Less frequent oxygen depletion in localized areas of the Bay. Physical Resources o Increased amounts of toxic wastewater residuals would require additional capacity in limited hazardous waste disposal sites. o Directly consumes construction materials. Energy o Increased energy consumption would result from the addition of pollution abatement processes. Amenities o No impacts.	Financial o See individual actions. Institutional o See individual actions.	Production of Goods and Services o Employment - job opportunities could result when treatment of industrial wastes reduces an industry's "share" of the assimilative capacity in the receiving water (or municipal plant's capacity) thus potentially accommodating industrial growth. Job opportunities may result in construction of treatment facilities and in-plant production changes. Job losses may result in industries unable to meet requirements. o Production in certain sectors may be reduced by plant closures. o Some industries have achieved increased production efficiency. Income and Investment o Investment in pollution control facilities. o Investment funds would be withdrawn from other areas of industrial activity. o Probable increases in pollution control workers wages. Consumer Expenditures o See individual actions.	Housing Supply o Housing industry is sensitive to diversion of investment funds. o Impacts on the supply and cost of new housing may result. Urban Patterns o In some cases may cause closure of industries--primarily in urban areas--if discharge requirements can't be met. o In other cases provides mechanism to allow industrial growth--and thereby urban growth--in conformance with Federal and State discharge requirements and needs of Bay Area environment. Health and Safety o Indirectly protects health and safety by removing gross toxicants and infectious agents from receiving waters. Physical Mobility o See individual actions. Sense of Community o Plant closures, job losses and out migration could alter community stability and character as community profiles change. This effect would be felt more in urban areas. Equity o See individual actions.
Impacts same as noted for Policy 8.	Financial o No impacts. Institutional o No impacts.	Consumer Expenditures Direct Private Cost of Implementation o (1978-2000) $25,000,000/year (annualized costs @ 8% derived from national level estimates). o If pollution control measures are financed by increased costs of products, then consumer expenditures will increase. Other economic impacts are the same as noted for Policy 8.	Physical Mobility o Treatment costs borne by the petroleum industry may cause a rise in fuel prices and reduce mobility of population. Equity o Increased prices of consumer goods tend to disproportionately impact low and moderate income groups. Other social impacts are the same as noted for Policy 8.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 8.2 Issue and update permits for direct industrial discharges.		RWQCB.	Continuous.	Federal Water Pollution Control Act Amendments & Porter-Cologne Act.	$220,000	-0-	State appropriation.	EPA review.
Action 8.3 Expand existing and provide new facilities for pretreatment of industrial wastewaters discharged to municipal sewer systems.	Only that degree of treatment necessary to meet the municipalities discharge requirements are recommended at this time.	Individual private companies.	Continuous.		Undetermined. If all indirect dischargers had to treat to same level as direct dischargers, cost would be $15,000,000.	Undetermined	Private funds, Low-interest rate loans available.	Sewerage agencies.
Action 8.4 Issue and update permits for industrial discharges to municipal sewer systems.		Sewerage agencies.	Continuous.		Undetermined	Undetermined	User charges.	RWQCB

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 8.	Financial Direct Public Costs of Implementation o (1977-2000) $217,000/year (current cost of RWQCB effort). Fiscal Effects on Local Government o No change from current costs and methods of financing permitting programs. Institutional o No impacts - no change from current practices of permitting agencies.	Consumer Expenditures o No impacts. Other economic impacts are the same as noted for Policy 8.	Physical Mobility o No impacts. Equity o No impacts. Other social impacts are the same as noted for Policy 8.
Water Quality o Reduction of toxic discharges to sewers will protect sewage treatment plants from upset and decrease toxicant discharges to environment. Other environmental impacts are the same as noted for Policy 8.	Financial o No impact. Institutional o No impact.	Consumer Expenditures Direct Private Costs of Implementation o (1978-2000) $15,000,000/year (annualized costs derived from national level estimates). Other economic impacts are the same as noted for Policy 8.	Physical Mobility o No impacts. Other social impacts are the same as noted for Policy 8.
Impacts same as noted for Policy 8.	Financial Direct Public Costs of Implementation o Exact current expenditures by sewerage service entities is not known. Fiscal Effects on Local Government o No changes from present practices. Institutional o Impacts same as noted for Action 8.2.	Impacts same as noted for Action 8.2.	Impacts same as noted for Action 8.2

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—9								
REDUCE SEWAGE POLLUTION FROM SMALL BOATS IN MARINAS, HARBORS AND ENCLOSED BAYS.								
Action 9.1								
Improve monitoring and documentation of vessel waste pollution.	Conducting periodic bacterial sampling of waters at all areas of small boat congregation; document effectiveness of current programs.	SFBDRP.	Quarterly; commencing Dec., 1978	Porter-Cologne Act.	$150,000	$150,000	State & EPA grants.	
Action 9.2								
Establish no-discharge (treated or untreated sewage) zones within Bay Area.	Marinas, harbors, shellfish harvesting areas and water contact recreation areas would be declared no-discharge zones if present practices proven ineffective; enforced by U.S. Coast Guard.	SWRCB, RWQCB, and U.S. Coast Guard.	By January 30, 1982; contingent on results of 9.1.	PL 92-500 Sec. 312(f) 3,4: Porter-Cologne Act.	-0-	-0-		

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o No impacts. Water Quality o Reduced coliform bacteria contamination of waters in harbors and marinas and shellfish harvesting areas. Physical Resources o Enhanced water recreation potential and use - particularly marine organism harvesting. Energy o Facility construction and operation requires energy; actual increased demand would be minor. Amenities o Indirect visual amenity impacts - reduced amounts of floatable sewage solids.	Financial Direct Public Costs of Implementation o See below. Fiscal Effects on Local Governments o See below. Institutional o May require legislative amendments. o May require intergovernmental coordination.	Production of Goods and Services o Employment - Public & private sector job opportunities may result (basic and service sector). Income and Investment o Increased employment will increase wages and salaries in construction and equipment supply. o Increased capital investments (see examples below) required. o Increased profits may result for firms where production increases as a result of increased demand for products and services. o No impacts on profits of firms bearing costs of requirements, assuming costs can be passed on to consumers. Consumer Expenditures o Increased prices of goods and services at marinas would result.	Housing Supply o No impacts. Physical Mobility o Reduced pleasure craft travel time to pumpout facilities. Health and Safety o Reduced incidence of water quality related public health risks should accompany water quality improvements. Sense of Community o No impacts. Equity o Where costs of new requirements are wholly borne by boat owners the costs pollution clean-up would fall on the source of pollution Urban Patterns o No impacts.
Impacts same as noted for Policy 9.	Financial Direct Public Costs of Implementation (1978-200) $150,000/year (Administrative/Regulatory costs for Annual Monitoring Effort) Fiscal Effects on Local Governments o No impact. Institutional o Requires cooperation of RWQCB.	Impacts Same as noted for Policy 9.	Impacts same as noted for Policy 9.
Impacts same as noted for Policy 9.	Financial Direct Public Costs of Implementation o Incremental cost increases in on-going Coast Guard inspection and enforcement efforts. Fiscal Effects on Local Governments o Direct impacts on local government fiscal resources may result. Institutional o Impacts same as noted for Policy 9.	Consumer Expenditures o Holding tank systems which are cheaper than flow-thru type devices would be required. o Boat owners with flow-thru type devices would bear additional cost of converting to holding tanks. o $40 to $250 typical cost for holding tank systems. Other economic impacts are the same as noted for Policy 9.	Impacts same as noted for Policy 9.

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Action 9.3 Inform boating public of marine sanitation device programs.	Provide information on types of devices, matching shoreside facilities, schedules, procedures and costs.	ABAG & RWQCB.	1978 & 1979.	Joint Powers Agreement.	$5,000	$5,000	State appropriation.	
Action 9.4 All marinas and harbors to provide vessel holding tank pump-out facilities.		Marina/harbor owner.	January, 1980.	Harbors and Navigation Code, Sec. 776, McAteer-Petris Act (as amended).	$500,000	$500,000	Owners-local and private funds; State Department of Navigation and Ocean Development (DNOD) funds.	SWRCB and BCDC permit programs.
Action 9.5 All marinas and harbors to provide on-shore toilet facilities.	For marinas, harbors, boat launch areas. Most appear to have adequate facilities--there are some exceptions.	Marina/harbor/ launch area owner.	January, 1980.	New State legislation required for existing facilities; McAteer-Petris Act (as amended) for new facilities.	Undetermined	Undetermined	Local and private funds; loans and grants from DNOD.	None yet for existing facilities; BCDC for new facilities.
Action 9.6 Revise DNOD's loans and grants programs to fund pump-out facilities and on-shore toilets.	Presently funds pump-out facilities only as part of overall new harbor or marina package.	California Department of Navigation and Ocean Development.		Harbors and Navigation Code; Div. 1, Chapter 2, Article 3; Revision of DNOD policy required.	-0-	-0-	Harbors & Water Craft Revolving Fund; Motor Vehicle Fuel Fund.	Governor's Executive Order.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 9.	Financial Direct Costs of Implementation (1978 and 1979) $30,000/year (Administrative Costs of Public Information Program) Fiscal Effects on Local Governments o No impacts. Institutional o No impact.	Production of Goods and Services o No impacts. Income and Investment o No impacts. Consumer Expenditures o No impacts.	Impacts same as noted for Policy 9.
Impacts same as noted for Policy 9.	Financial Direct Public Costs of Implementation Example Costs to Public Marinas for Pumpout Facilities: Capital (1980) $20,000 < 100 berths $45,000 > 100 berths O & M (1981-2000) $2,000 - 4,500/year Administrative/Regulatory Costs to Ensure Compliance - Issue Permits: (1980) $80,000/First Year (1981-2000) $15,000/Year Fiscal Effects on Local Governments o Direct impacts on fiscal resources would result even with grant subvention. Fiscal impacts depend on revenue source used for local share of costs (user charges, bonds, revenue sharing). Institutional Impacts same as noted for Policy 9.	Production of Goods and Services o Employment - Jobs may be created in consulting firms, pumping equipment manufacturing firms, other materials manufacturing and contracting or construction firms. Income and Investment o Impacts same as noted for Policy 9 (see also direct private costs). Consumer Expenditures o Prices of services at marinas (rental fees, pumpout fees) would increase. Direct Private Costs of Implementation Example Costs to Private Marinas for Pumpout Facilities: Capital (1980) $20,000 < 100 berths $45,000 > 100 berths O & M (1981-2000) $2,000 - 4,500/year	Impacts same as noted for Policy 9.
Impacts same as noted for Policy 9.	Financial Direct Public Costs of Implementation Example Costs to Public Marinas for Toilet Facilities: Capital (1980) $42,000/marina O & M (1981-2000) $4,200/year (Administrative/Regulatory Costs are included in 9.4 costs) o Most marinas appear to have adequate toilet facilities. Fiscal Effects on Local Governments o Impacts same as noted above for Action 9.4. Institutional o Requires new regulations and administrative rule-making.	Consumer Expenditures Direct Private Costs of Implementation Example Costs to Private Marinas for Toilet Facilities: Capital (1980) $42,000/marina O & M (1981-2000) $4,200/year o Most marinas appear to have adequate toilet facilities. Other economic impacts are the same as noted for Action 9.4.	Impacts same as noted for Policy 9.

Assessment should be part of any amendment process of applicable State grants and loan programs. Amendment of the Department of Navigation and Ocean Development grant and loan program would, in general, distribute monies from gasoline tax revenues to both public and private marinas to pay for provision of facilities. Currently, public marinas charge nominal fees or do not charge at all for use of pumpout facilities.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION

Policy—10

IMPROVE WASTEWATER DISPOSAL PRACTICES IN UNSEWERED AREAS.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o Instances of odorous conditions due to system failures should decrease. Water Quality o Reduce coliform bacteria contamination of surface and groundwaters. Physical Resources o Increased land requirements for on-site systems may result in competition with agricultural uses. o Increased water contact and non-contact (e.g. swimming, fishing, boating) recreation potential and use in streams and lakes now polluted by septic tank drainage. Energy o Onsite disposal systems use less energy than centralized sewerage treatment systems. Amenities o Visual amenity impacts-reduced likelihood of algal blooms from high nutrient concentrations in water bodies and in streams (especially during low flow periods).	Financial Direct Costs of Implementation See below Fiscal Effects on Local Government See below Institutional o May require new legislation, amendments to regulations, codes. o May require intergovernmental coordination. o May require organizational changes or creation of new agencies.	Production of Goods and Services o Employment - Creation of new job opportunities in the public and private sectors may result. Income Investment o Increased wages and salaries in sectors where increased demand for goods and services results in new jobs. o Increased capital investments may be required. o Increased profits for firms where increased demand stimulates increased production. Consumer Expenditures o Increased prices of goods and services may occur.	Housing Supply o Increased costs of existing housing maintenance and rehabilitation would result. o Location and density constraints may reduce new starts (supply) in areas proposing to use onsite system. o Increased new housing costs may result from decreased supply and costs to comply with new standards. Physical Mobility o No impacts. Health and Safety o Reduced likelihood of raw sewage ponding on surface, discharging to water bodies and drainage ways. o Fewer conditions which promote vectors and other noxious species (e.g. rodents, mosquitos, flies, algae). o Reduced health risks associated with bacterial contamination of ground and surface waters. Sense of Community o No impacts. Equity o Indirect impacts may result through impacts on costs of new and existing housing. o Whre costs of new requirements or public management are wholly borne by residents of management area, the equity effects would depend on the social profile of the area and the financing mechanism chosen. Urban Patterns o Impacts on the location, timing, density, and amount of new development may result.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 10.1								
Establish minimum regionwide standards for on-site disposal systems.	a). Standards for selection, design, evaluation and construction of on-site disposal systems. Standards would preclude substandard "interim" on site systems awaiting a "future" sewer.	RWQCB with assistance from County Health Departments and ABAG.	By December 1979, annually thereafter.	Porter-Cologne Act, enabling laws for County Health Departments.	$10,000	$10,000	State funds, Federal grants, local funds.	Voluntary, coordinated by ABAG.
	b). Incorporate new standards in local building codes and ordinances.	City and county governments.	By April, 1980.	Local government enabling legislation.	Undetermined	Undetermined	Local funds.	
Action 10.2								
Establish public management of new on-site systems.	Monitor, service and repair functions exercised for new developments, where on-site systems are technically appropriate.	Local governments (including special districts.	October, 1978.	Porter-Cologne Act.	Undetermined (cost of public management estimated to be $65 per home).	Undetermined	Property taxes; service fees; "201", State Clean Water grants.	RWQCB and require public management of new developments.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 10.	Financial Direct Public Costs of Implementation (1979) $20,000 (First year administrative costs of standard revision) (1980-2000) $10,000/year (Annual standard revision) (1980) $45,000 (Cost to revise codes and ordinances - regional total or $450/jurisdiction) Fiscal Effects on Local Governments o No impact. Institutional o Existing ordinances, codes, regulations would need to be modified or amended. o Requires cooperation of numerous local and regional authorities.	Income and Investment o Profits of firms bearing costs of meeting updated standards should not be affected assuming costs can and will be passed on to the consumer (industry-dependent response). Consumer Expenditures o Indirect increased prices of homes may result from increased costs to meet new requirements.	Health and Safety o Standard enforcement should decrease development on unstable land and in flood plains. Urban Patterns o Would tend to discourage developments with marginal on-site systems in favor of sewered areas. Other social impacts are the same as noted for Policy 10.
Physical Resources o Indirect impacts on solid waste management practices-land fill capacities and alternative sludge disposal practices (see example for Action 10.3). Other environmental impacts are the same as noted for Policy 10.	Financial Direct Public Costs of Implementation (1978-2000) $45,000/Management Agency/year (Example of Administrative/Regulatory costs for one year to inspect and monitor an area with 1000 septic tanks) Fiscal Effects on Local Government o Impacts on fiscal resources would depend on choice of financing mechanism. If financed by annual assessments, based on assessed value, the property tax rate in the management zone would increase. o An example charge based on assessed valuation: (1978-2000) home/year (assuming a $50,000 home) or .27/100 A.V. Institutional o Direct impacts on legal capabilities may require creation of special districts or new service areas; expansion of responsibilities of existing agencies or districts; modifications to rules, regulations, and ordinances. o Direct impacts on intergovernmental responsibilities and coordination due to required cooperation of county health departments, RWQCB, zoning authorities, LAFCOs, service districts-may be mitigated by formal cooperative agreements, memoranda of understanding.	Production of Goods and Services o Employment- Increased job opportunities may result if inspection services are contracted to private firms or individuals, new jobs may result in pumpout businesses and in equipment supply firms. o Increased demands for maintenance services may result in new firms entering the market. Other economic impacts are the same as noted for Policy 10.	Housing Supply o Costs of new housing may increase due to supply effects, cost to meet new standards and inspection service charges. Other social impacts are the same as noted for Policy 10.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 10.3 Permit public management of existing on-site systems.	Optional where on-site systems technically appropriate; recognizes that factors other than maintenance can cause failure.	Local governments.	As permitted by legislation.	State S.B. 430-proposed.	Undetermined	Undetermined	Property taxes, service fees; "201", State Clean Water grants.	RWQCB can issue waste discharge permits for on-site systems.
Action 10.4 Where on-site systems are inappropriate--install sewerage system.	County Health Department survey identifying problems leads to RWQCB cease and desist order and need for sewers. New developments not meeting updated standards for on-site would automatically need sewers.	Local sewerage agencies.	On-going.	Porter-Cologne Act.	Undetermined	Undetermined	System financed via "201", State Clean Water grants, local bonds, assessments, service charges, property taxes, etc.	RWQCB cease and desist order. Health Department can force evacuation of dwellings.
Action 10.5 Promote research of on-site disposal systems.	To improve on-site systems, develop new design and construction criteria and develop new systems.	Governor's Office of Appropriate Technology, private industry.	On-going.	California Government Code 65025 et seq.	Undetermined	Undetermined	State funds, perhaps Federal subsidies; private funds.	Voluntary.
Action 10.6 Revise State & Federal grants programs to ensure consideration for funding on-site systems.	To maximize the number of on-site system and maintenance district components eligible for funding.	SWRCB, EPA	On-going.	PL 92-500; Porter-Cologne Act.	-0-	-0-	"201", State Clean Water grants program.	

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Physical Resources o Indirect impacts on solid waste management practices-land fill capacities and alternative sludge disposal practices (e.g., pumpout of 1700 onsite systems may produce 9600 gallons of septage to be disposed of every week. o Treatment prior to disposal could be a problem as treatment facilities near unsewered areas may not be able to handle increased volumes and concentration levels of septage. o In some cases, functioning onsite systems may reduce need to expand sewage treatment plant capacity. Other environmental impacts are the same as noted for Policy 10.	Financial Direct Public Costs of Implementation $175,000 (First year costs to locate and inspect 5000 onsite systems which is average number per county based on 1970 census data) $76,000/year (Annual cost to monitor and inspect 1700 onsite systems beginning in year 2 and allowing for 100 new systems/year) Fiscal Effects on Local Government o Impact on fiscal resources would depend on choice of financing mechanism. Costs of first year effort would probably require direct grants. o An example annual charge based on assessed value: $45 (for a $50,000 home) or $.16/100 A.V.	Impacts same as noted for Action 10.2.	Housing Supply o Existing housing rehabilitation and maintenance costs may increase (example costs: system reconstruction-$1300, modification for pumpout access - $260, pumpout costs - $50-65). Other social impacts are the same as noted for Policy 10.
See Impact Assessment for Municipal Element. A project's inclusion on the 20 year project list does not absolve the potential grantee from EIR/EIS requirements for funding under the Federal Water Pollution Control Act Amendments and the Clean Water Grants programs.			
Impacts same as noted for Policy 10.	Financial Direct Public Costs of Implementation Office of Appropriate Technology-ongoing research funds. Institutional o No impacts.	Impacts same as noted for Policy 10.	Impacts same as noted for Policy 10.
Assessment should be part of any amendment process of the Federal and State grants programs. In general, if construction of publically managed onsite disposal system is subsidized by Federal and State grant monies, one effect is to return taxpayers monies without bias toward any one method of treatment. Where such grant provision subsidizes second home developments, certain sectors of the population are disproportionately benefited. Payment for operation and maintenance costs would not be altered by grant amendments (i.e. they would continue to be paid for by user charges of one type or another). Note that eligibility amendments would result in reassessment of the 20 year project list as a part of the Continuing Planning Process.			

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Policy—11								
IMPROVE COORDINATION AND PERFORMANCE OF AGENCIES IN PREVENTING AND DEALING WITH OIL AND CHEMICAL SPILLS IN BAY AREA.								
Action 11.1 Coordinate activity of State, Federal and local agencies.	Provide coordination services for facility inspections, contingency planning, spill handling, policy development and public information programs.	RWQCB.	October, 1978.	Porter-Cologne Act.	$10,000	$10,000	State funds.	Voluntary.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o No impacts. Water Quality o Reduced incidence of water pollution from hazardous materials spills. o Reduced incidences of impairment of beneficial uses of bay waters. Physical Resources o Reduced incidence of spills and improved spill clean-up would protect: - aquatic community - flora and fauna-wildlife habitats (marshes, salt ponds) - water-related recreation use and potential o Impacts on solid waste management may result: - spill clean-up often requires disposal in Class I sites (See Hazardous Waste Element of Solid Waste Management Plan) Energy o No impacts. Amenities o Indirect visual amenity benefits associated with reduced incidence of oil spills and improved containment and disposal.	Financial Direct Public Costs of Implementation o See below Fiscal Effects on Local Governments o Local spill prevention and clean-up programs may require commitment of local fiscal resources. Institutional o Direct impacts on intergovernmental responsibility and coordination - requires cooperation of numerous Federal, State, regional and local agencies.	Production of Goods and Services o Employment- Public and private sector job opportunities may result from improved enforcement and new requirements. Income and Investment o New requirements and enforcement of spill prevention programs may require private capital investments. o Profits of firms bearing costs of new requirements or improved enforcement should not be affected, assuming costs will be passed on to the consumer. Consumer Expenditures o Increased prices of goods and services (especially petroleum and chemical based products) may result when costs incurred to comply with spill prevention programs are passed on to the consumer.	Housing Supply o No impact. Physical Mobility o No impact. Health and Safety o Reduced potential for public exposure to health and safety risks. Sense of Community o No impact. Equity o No impact. Urban Patterns o No impact.
Impacts same as noted for Policy 11.	Financial Direct Public Costs of Implementation (1978-2000) $10,000/year Administrative Costs of designated agency Fiscal Effects on Local Governments o No impacts Institutional o May require legislation or executive order to designate coordinating agency, coordination may require modification of existing regulations, rules, organizational structure. o Direct impacts on intergovernmental responsibility and coordination - requires cooperation of Coast Guard, EPA, DFG, RWQCB, OES, Caltrans, local fire departments.	Production of Goods and Services o Employment- Coordinating agency staff may increase slightly. Income and Investment o No impacts. Consumer Expenditures o No impacts.	Impacts same as noted for Policy 11.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 11.2 Monitor performance of agencies in Bay Area.	Monitor all agencies in dealing with spills including U.S. Coast Guard, Department of Fish & Game, EPA, RWQCB, Office of Emergency Service, fire departments and local contractors.	RWQCB.	Continuous after October 1978.	Porter-Cologne Act.	$15,000	$15,000	State funds.	Voluntary.
Action 11.3 Report annually to Governor, EPA Administrator and Secretary of Transportation.	Formally report on coordination, prevention efforts, cleanup performance and recommended actions.	RWQCB.	Annually, after October, 1978.	Porter-Cologne Act.	$15,000	$15,000	State funds.	Voluntary.
Action 11.4 Develop local roadway spill containment and cleanup capabilities.	Local fire departments would prepare plans for dealing with a variety of spilled chemicals.	Local fire departments,	By December, 1978.	Local government enabling legislation.	Undetermined	Undetermined	Local funds.	Voluntary.
Action 11.5 Reevaluate need to upgrade vessel traffic system in Carquinez Strait and N. San Pablo Bay.	A report would be prepared examining the addition of high-resolution radar coverage to the subject areas.	U.S. Coast Guard.	By June, 1979.	Ports and Waterways Safety Act of 1972.	$1,000	$1,000	Federal funds.	Voluntary.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 11.	Financial Direct Public Costs of Implementation (1978-2000) $15,000/year (Administrative costs to monitor agencies' performance) Other institutional/financial impacts are same as noted for Policy 11.	Impacts same as noted for Policy 11.	Impacts same as noted for Policy 11.
Impacts sames as noted for Policy 11.	Financial Direct Public Costs of Implementation (1979-2000) $16,000/year (Administrative costs of preparing report and the review of the report) Institutional o Annual report may recommend statutory changes, new regulations. Other institutional/financial impacts are same as noted above for Policy 11.	Impacts same as noted for Policy 11.	Impacts same as noted for Policy 11.
Impacts same as noted for Policy 11.	Financial Direct Public Costs of Implementation Costs of training programs depend on duration of the classes, number of individuals selected for training, type of program. Fiscal Effect on Local Government o Local fiscal resources may be required to finance program development and training (cost/ fire department). Institutional o Temporary impacts associated with fire department staff time for program development and training.	Impacts same as noted for Policy 11.	Impacts same as noted for Policy 11.
Air Quality o No impacts. Water Quality o Reduced tanker accidents expected from traffic system should benefit water quality if radar system is recommended. o Reduced chances of impaired uses of San Pablo Bay and Carquinez Straits if radar system is added. Physical Resources o Reduced potential for spills from tanker accidents should reduce risks to physical resources. Example of resources which could be impacted: wildlife refuges, waterflow management areas, habitats of rare and endangered species, anadromous fish migration routes, other fish and shellfish resources, water-related recreation resources. Energy o No impacts. (Energy required to operate additions to radar system would be small increment.)	Financial Direct Cost of Implementation (1979) $10,000 (Cost to prepare a report on the cost-effectiveness of additional radar facility) Fiscal Effects on Local Governments o No impacts. Institutional o No impact.	Production of Goods and Services o Employment- Minor short-term increase. Income and Investment o No impact. Consumer Expenditures o No impact.	Housing Supply o No impact Physical Mobility o No impact. Health and Safety o No impact. Sense of Community o No impact. Equity o No impact. Urban Patterns o No impact.

WATER QUALITY MANAGEMENT PLAN RECOMMENDATIONS (continued)

RECOMMENDATIONS	GENERAL DESCRIPTION	IMPLEMENTING AGENCY (OR AGENCIES)	SCHEDULE FOR ACTION	LEGAL AUTHORITY	TOTAL COST/YEAR OF RECOMMENDED ACTION	PORTION OF TOTAL COST/YR. DIRECTLY ATTRIBUTABLE TO THIS PLAN	FINANCING MECHANISM	MEASURES TO ENSURE IMPLEMENTATION
Action 11.6 Incorporate report results from 11.3 and 11.5 into the EMP.	A function of the continuing planning process.	ABAG.	By December, 1979.	PL 92-500, Sec. 208	$7,000	$7,000	Local funds, supplemented by State and Federal Grants.	Voluntary.
Action 11.7 Enact State legislation proposing increases in liability of spillers.	Senate bills currently addressing the topic are SB 536, SB 841.	State Legislature.	On-going.	State Constitution.	Undetermined	Undetermined		Voluntary.
Action 11.8 Enact Federal legislation proposing increases in liability of spillers.	The proposed Federal Comprehensive Oil Pollution Liability and Compensation Act also establishes a cleanup fund.	U.S. Congress.	On-going.	U.S. Constitution.	Undetermined	Undetermined		Voluntary.
Action 11.9 Promulgate final Federal regulations proposing improvements in requirements for navigational aids and tanker construction.	Proposed DOT standards issued 13 May '77 include: o Double bottoms on new large tankers. o Segregated ballast on new large tankers. o Inert gas systems on all crude oil tankers. o Backup radar systems with collision avoidance equipment on all large tankers. o Improved emergency steering standards for all tankers. Also S.682	U.S. Department of Transportation, U.S. Congress.	On-going.	Ports and Waterways Safety Act of 1972.	Undetermined (if proposed standards are finalized, the initial construction cost to bring U.S. vessels up to standards estimated to be $120,000,000).	Undetermined	Local funds supplemented by State and Federal Grants.	

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Impacts same as noted for Policy 11.	Financial Direct Cost of Implementation (1979-2000) $7200/year (Administrative Costs) Other institutional/finanical impacts same as noted for Policy 11.	Impact same as noted for Policy 11.	Impacts same as noted for Policy 11.
	Specific impacts of Federal and State legislation and regulations should be assessed by responsible Federal and State agencies.		
Impacts same as noted for Policy 11.	Impacts same as noted for Policy 11.	Consumer Expenditures o New requirements will result in increased prices of consumer products. Other economic impacts are the same as noted for Policy 11.	Impacts same as noted for Policy 11.

Chapter—8

Costs and benefits of the plan

The costs and benefits of the plan are shown in Table 3.

The principal benefit of implementing the plan will be an improvement in water quality in the bay and the region's streams and lakes. The more obvious pollution problems such as oxygen depletion in the South Bay and sloughs receiving waste discharge will be eliminated or greatly reduced. Fish kills will occur less frequently. Bacterial contamintion of shellfish will be reduced which could ultimately lead to the reestablishment of commercial shellfishing in the bay. The incidence of failure of septic tank systems will be reduced.

Secondary benefits will accrue from the recommended streamlining of arrangements for monitoring the effects of waste discharges on the receiving waters, conducting research into the remaining water quality problems, and translating the resulting information into improved waste discharge requirements that will protect aquatic life and other beneficial uses.

The cost of providing the facilities needed to clean up municipal and industrial waste discharges is extremely high. None of this cost is directly attributable to this plan, however, because the plan does not recommend higher levels of treatment than those already required by State and Federal laws. The cost of the municipal facilities will be passed on to the homeowner or other user of the municipal sewer in the form of increased connection fees, service charges and property taxes. The cost of industrial facilities will be passed on to the consumer as price increases for goods and services. Although the total cost is great the impact of water pollution control-related costs on the individual's budget will, in most cases, be slight.

Provision of holding tank pump-out facilities at marinas and harbors will cost the equivalent of $ 0.5 million each year and will be passed on to boat owners in the form of increased mooring and pump-out fees. Public management of septic tank systems will cost about $65 per household per year within the management district.

Construction of municipal and industrial wastewater facilities will have a number of other effects. Funds used for this purpose cannot be used for other purposes that might be equally or more beneficial to society. A large number of jobs in the construction trades will be generated. A much smaller number of jobs will be created that will be involved with operation and maintenance of the new facilities. Short-term environmental impacts such as increased noise and dust levels will result from construction activities.

Construction of municipal wastewater facilities will accommodate urban growth. In areas where growth is prevented by a lack of sewerage service, provision of the service will release the constraint and thus will induce growth.

Appendix A
Beneficial uses and water quality objectives

BENEFICIAL USES

The following definitions for beneficial uses are applicable throughout the entire state.

Municipal and Domestic Supply (MUN)- Includes usual uses in community or military water systems and domestic uses from individual water systems.

Agricultural Supply (AGR)- Includes crops, orchard and pasture irrigation, stock watering, support of vegetation for range grazing and all uses in support of farming and ranching operations.

Industrial Process Supply (PROC)- Includes process water supply and all uses related to the manufacturing of products.

Industrial Service Supply (IND)- Includes uses that do not depend primarily on water quality such as mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Groundwater Recharge (GWR)- Natural or artificial recharge for future extraction for beneficial uses and to maintain salt balance or halt salt water intrusion into freshwater aquifers.

Freshwater Replenishment (FRSH)- Provides a source of freshwater for replenishment of inland lakes and streams of varying salinities.

Navigation (NAV)- Includes commercial and naval shipping.

Water Contract Recreation (REC-1)- Includes all recreational uses involving actual body contact with water, such as swimming, wading, waterskiing, skindiving, surfing, sport fishing, uses in therapeutic spas, and other uses where ingestion of water is reasonably possible.

Non-Contact Water Recreation (REC-2)- Recreational uses that involve the presence of water but do not require contact with water, such as picnicking, sunbathing, hiking, beachcombing, camping, pleasure boating, tidepool and marine life study, hunting and aesthetic enjoyment in conjunction with the above activities as well as sightseeing.

Ocean Commercial and Sport Fishing (COMM)- The commercial collection of various types of fish and shellfish, including those taken for bait purposes, and sport fishing in oceans, bays, estuaries and similar non-freshwater areas.

Warm Freshwater Habitat (WARM)- Provides a warm water habitat to sustain aquatic resources associated with a warm water environment.

Cold Freshwater Habitat (COLD)- Provides a cold water habitat to sustain aquatic resources associated with a cold water environment.

Preservation of Areas of Special Biological Significance (ASBS)- Area of Special Biological Significance are those areas designated by the State Water Resources Control Board as requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable.

Saline Water Habitat (SAL)- Provides an inland saline water habitat for aquatic life resources. Soda Lake in the Central Basin is a saline habitat typical of desert lakes in inland sinks.

Wildlife Habitat (WILD)- Provides a water supply and vegetative habitat for the maintenance of wildlife.

Preservation of Rare and Endangered Species (RARE)- Provides an aqautic habitat necessary, at least in part, for the survival of certain species established as being rare and endangered species.

Marine Habitat (MAR)- Provides for the preservation of the marine ecosystem including the propagation and sustenance of fish, shellfish, marine mammals, water fowl and vegetation such as kelp.

Fish Migration (MIGR)- Provides a migration route and temporary aquatic environment for anadromous or other fish species.

Fish Spawning (SPWN)- Provides a high quality aquatic habitat especially suitable for fish spawning.

Shellfish Harvesting (SHELL)- The collection of shellfish such as clams, oysters, abalone, shrimp, crab and lobster for either commercial or sport purposes.

Hydropower Generation (POW)- Used for hydropower generation. No such sites are presently located in San Francisco Bay Basin.

Table — A1.
Beneficial uses of surface waters

	SURFACE WATERS	MUN	AGR	IND	PROC	GWR	FRSH	NAV	POW	REC 1	REC 2	COMM	WARM	COLD	ASBS	SAL	WILD	RARE	MAR	MIGR	SPWN	SHELL
1	Merced Lake	○									●			●			●					
2	Crystal Springs Lakes	●									●		●	●			●	●				
3	San Mateo Creek						●			○	○			○			●	●				
4	Pilarcitos Lake	●									○			●			●	●				
5	Pilarcitos Creek	●	●							○	○			●			●	●		●	●	
6	San Andreas Lake	●									●		●	●			●	●				
7	San Vicente Creek		●							○	○			●			●	●		●	●	
8	Denniston Creek		●							●	●		●	●			●	●		●	●	
9	Frenchmans Creek		●							●	●			●			●	●		●	●	
10	Purisima Creek		●							●	●			●			●	●		●	●	
11	Lobitas Creek		●							●	●			●			●	●		●	●	
12	Tunitas Creek		●							○	○			●			●	●		●	●	
13	San Gregorio Creek		●							●	●		●	●			●	●		●	●	
14	Pescadero Creek		●							●	●			●			●	●		●	●	
15	Searsville Lake		●							●	●		●	●			●					
16	Felt Lake		●							●	●		●				●					
17	San Francisquito Creek									○	○		●	●			●			●	●	
18	Stevens Creek Reservoir	●				●					●		●	●			●			●	●	
19	Stevens Creek						●			●	●		●	●			●			●	○	
20	Calero Reservoir	●				●				●	●		●				●					
21	Almaden Reservoir	●				●				●	●		●				●					
22	Guadalupe Reservoir	●				●				○	○		●				●					
23	Lake Elsman	●									○			●			●					
24	Campbell Percolation Ponds					●							●	●			●					
25	Lexington Reservoir	●								●	●		●	●			●					
26	Vasona Reservoir					●				●	●		●	●			●					
27	Cotton Wood Lake									●	●		●	●			●					
28	Los Gatos Creek	●				●	●				○			●			●			○	○	
29	Sandy Wool Lake										●		●	●			●					
30	Guadalupe River									○	●		●				●			○	○	
31	San Felipe Creek									○	○		●	○			●					
32	Coyote Reservoir	●	●							○	○		●	●			●					
33	Anderson Reservoir	●				●				●	●		●	●			●					
34	Cherry Flat Reservoir	●	●							○	○		●				●				●	
35	Coyote Creek [1]									○	●		●	●			●	●		●	●	
36	Arroyo De La Laguna [1]					●				●	●		○	○			●			●	●	
37	Shadow Cliffs Reservoir									●	●		●	●			●					
38	Arroyo Del Valle [1]	●				●				○	○			●			●			○		
39	Del Valle Reservoir	●								●	●		●	●			●					
40	Alameda Creek		●			●				●	●		●	●			●			○	○	
41	Elizabeth Lake										●		●	●			●					
42	Arroyo Hondo [1]	●					●			●	●		●	●			●				●	
43	Calaveras Reservoir	●									○		●	○			●					
44	San Antonio Reservoir	●									○		●	●			●					
45	Cull Canyon Reservoir									●	●		●	○			●					
46	San Lorenzo Creek [1]									●	●		●	●			●			●	●	
47	San Leandro Reservoir	●									○		●	●			●					
48	Lake Chabot	●									●		●	●			●					
49	San Leandro Creek						●			○	○		○	●			●			○	○	
50	Lake Temescal									●	●		●				●					
51	Lake Merritt									●	●		●	●			●					
52	Briones Reservoir	●								○	○		●	○			●					
53	San Pablo Reservoir	●								●	●		●	●			●					
54	Lafayette Reservoir	●								●	●		●	●			●					
55	Pinole Creek									○	○		●	●			●			●	●	
56	Walnut Creek [1]									○	○		●	●			●					
57	Mallard Reservoir [2]	●	●	●	●						○		●				●					
58	Marsh Creek									○	○		●				●	●				
59	Marsh Creek Reservoir									○	○		●				●	●				
60	Contra Loma Reservoir [2]	●	●	●	●						●		●	●			●					
61	Lake Curry	●									○		●				●					
62	Lake Madigan	●	●								●		●	●			●					

Table-A 1. Existing and Potential Beneficial Uses of Surface Waters (continued)

	SURFACE WATERS	MUN	AGR	IND	PROC	GWR	FRSH	NAV	POW	REC1	REC2	COMM	WARM	COLD	ASBS	SAL	WILD	RARE	MAR	MIGR	SPWN	SHELL
63	Lake Frey	●									●		●				●					
64	Suisun Creek									○	○		●	●			●			●	●	
65	Suisun Slough									●	●		●				●					
66	Montezuma Slough									●	●		●				●	●				
67	Lake Herman	●									○		●	●			●					
68	Chiles Creek	●					●			○	○		●	●			●					
69	Sage Creek	●					●			○	○		●	●			●					
70	Lake Hennessey	●									●		●	●			●				●	
71	Conn Creek	●					●			●	●			●			●			●	●	
72	Rector Reservoir	●									●		●	●			●					
73	Milliken Reservoir	●									○		●				●					
74	Lake Marie	●	●							○	○		○				●					
75	Lake Chabot	●	●							●	●		●	●			●					
76	Dry Creek	●	●							●	●			●			●			●	●	
77	York Creek									○	○			●			●			●	●	
78	Napa River	●	●					●		●	●		●	●			●	●		●	●	
79	Sonoma Creek									●	●		●	●			●	●		●	●	
80	Petaluma River							●		●	●		●	●			●	●		●	●	
81	San Antonio Creek									○	○		●	●			●			○	○	
82	Stafford Lake	●									●		●	○			●					
83	Novato Creek	●								○	○		○	○			●			○	○	
84	Rodeo Lagoon									●	●			●			●					
85	Miller Creek									○	○		●	●			●	●		○	○	
86	Lake Lagunitas	●									●		●	●			●					
87	Bon Tempe Lake	●									●		●	●			●					
88	Alpine Lake	●									●		●	●			●					
89	Kent Lake	●									●		●	●			●					
90	Lagunitas Creek									●	●			●			●	●		●	●	
91	Phoenix Lake	●									○		●	●			●					
92	Nicasio Creek	●					●			●	●			●			●			●	●	
93	Nicasio Reservoir	●					●				○		●				●					
94	Olema Creek									●	●			●			●			●	●	
95	Walker Creek									○	○			●			●	●		●	●	
96	Crystal Lake									○	○		●				●					
97	Pacific Ocean			●				●		●	●	●			●		●	●	●	●	●	●
98	South Bay			●				●		●	●	●					●	●	●	●	○	●
99	Lower Bay			●				●		●	●	●					●	●	●	●	○	●
100	Central Bay			●	●			●		●	●	●					●	●	●	●	●	●
101	San Pablo Bay			●				●		●	●	●					●	●	●	●	●	●
102	Suisun Bay & Lower San Joaquin			●	●			●		●	●	●					●	●	●	●	●	
103	Delta			●	●			●		●	●	●	●				●	●		●	●	
104	Bolinas Lagoon									●	●	●			●		●	●	●	●	●	●
105	Drakes Estero									●	●	●			●		●	●	●		●	●
106	Limantour Estero									●	●	●			●		●	●	●		●	●
107	Tomales Bay									●	●	●			●		●	●	●	●	●	●
108	San Pedro Creek										●		●	●			●			●	●	
109	Pomponio Creek		●							○	●			●			●			●	●	
110	Corte Madera Creek									○	●			●			●	●				
111	Old Mill Creek										●			●			●					
112	Pine Gulch Creek	●									●			●			●			●	●	
113	Kimball Reservoir	●									○		●				●					

NOTES:

1. Includes Upstream Tributaries.
2. Offstream Reservoir.

○ Potential Beneficial Use.

● Existing Beneficial Use.

PRESENT AND POTENTIAL BENEFICIAL USES

State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the state. Therefore, all water resources must be protected from the pollution and nuisance that may occur as a result of waste discharges. Beneficial uses of surface waters, groundwaters, and coastal waters presented here serve as a basis for establishing water quality standards and discharge prohibitions to attain this goal.

It is believed that the list of beneficial uses in Table A-1 accurately reflects future demands on the water resources of the basin. Beneficial uses presented here were selected by the basin plan environmental planning staff and presented at a public workshop to permit additional input from the public and various agencies interested in water quality control. Anticipated future beneficial uses of water in the Basin are also included; however, these uses may vary for any given body of water depending upon future population needs, land use and water resource development.

Surface Waters

Over 100 water bodies (in the case of the Bay system receiving water segments) were considered for which beneficial water uses are enumerated. Since most freshwater rivers or streams in the basin are insufficient in volume to serve as principal municipal and industrial supplies, these demands are met largely by freshwaters imported from outside the basin. Surface waters of the Bay proper, however, are used extensively by industry largely for cooling purposes. In general, each body of surface water possesses the potential to accommodate most of the designated beneficial uses. The specific beneficial uses for inland streams include: municipal and domestic supply, agricultural supply, industrial process supply, groundwater recharge, water contact recreation, noncontact water recreation, wildlife habitat, cold freshwater habitat, warm freshwater habitat, fish migration and fish spawning. Similar uses are also made of Lower San Joaquin and Delta waters. The remaining surface waters of the Bay and ocean include all of the above except freshwater habitat as a beneficial use and in addition incorporate industrial service supply and navigation as beneficial uses.

With increasing environmental awareness, the requirement to preserve and enhance natural conditions becomes more evident. The Bay, lakes and streams are pleasant to view, particularly in those areas which are readily accessible. Thus, aesthetic enjoyment of surface water has been included in the definition of non-water contact recreation (REC-2).

Groundwaters

Present and potential beneficial uses applicable to all groundwater basins shown in Figure 2-2 are municipal supply, industrial process water supply and agricultural uses.

Coastal Waters

Beneficial uses of coastal waters are included with remaining surface waters in the Basin in Table A-1. Identified as receiving water segment 97 in the table, coastal waters include such beneficial uses as water contact recreation, nonwater contact recreation, industrial service supply, navigation, marine habitat, shellfish harvesting, ocean commercial and sport fishing, areas of special biological significance and preservation of rare and endangered species. The California coastline within San Francisco Bay Basin is endowed with exceptional scenic beauty contributing significantly to the natural environment known as the San Francisco Bay area.

WATER QUALITY OBJECTIVES

INTRODUCTION

Section 13241, Division 7 of the California Water Code, specifies that each Regional Water Quality Control Board shall establish water quality objectives which, in the Regional Board's judgment, are necessary for the reasonable protection of beneficial uses and for the prevention of nuisance.

Section 303 of the 1972 Amendments to the Federal Water Pollution Control Act requires the State to submit to the Administrator of the U.S. Environmental Protection Agency for this approval, all new or revised water quality standards which are established for surface and ocean waters. Under federal terminology, water quality standards consist of the beneficial uses enumerated in Table A-1 and the water quality objectives contained in this chapter.

The water quality objectives contained herein are designed to satisfy all state and federal requirements.

As new information becomes available, the Regional Board will review the appropriateness of the objectives contained here. These objectives will be subject to public hearing at least once during each three-year period following adoption of this plan for the purpose of review and modification as appropriate.

EXISTING STATEWIDE PLANS AND POLICIES

The State Water Resources Control Board has adopted a "Statement of Policy with Respect to Maintaining High Quality of Waters in California", the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California", the "Water Quality Control Plan for Ocean Waters of California", and the "Water Quality Control Policy for the Enclosed Bays and Estuaries of California". The Regional Board is required to implement the provisions of these plans and policies.

Nondegradation Policy

On October 28, 1968, the State Water Resources Control Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California". While requiring the continued maintenance of existing high quality waters, the policy provides conditions under which a change in water quality is allowable. A change must:

- be consistent with maximum benefit to the people of the State,
- not unreasonably affect present and anticipated beneficial uses of water, and
- not result in water quality less than that prescribed in water quality control plans or policies.

These water quality objectives are considered to be necessary to protect those present and probable future beneficial uses enumerated in Table A-1 and to protect existing high quality waters of the State. These objectives will be achieved primarily through the establishment of waste discharge requirements and through the implementation of this water quality control plan.

The Regional Board in setting waste discharge requirements will consider, among other things, the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives. The Regional Board will make a finding as to the beneficial uses to be protected within the area of influence of the discharge and establish waste discharge requirements to protect those uses and to meet water quality objectives.

In general, the objectives are intended to govern the concentration of pollutant constituents in the main water mass. Obviously, the same requirements cannot be applied at or immediately adjacent to submerged effluent discharge structures. Allowable zones of dilution within which higher concentrations will be tolerated will be defined for each discharge at the time discharge permits are drafted. Expression of certain water quality objectives in the form of statistical distribution (50 and 90 percentile values) should also be considered when drafting discharge permits.

In the following section the objectives are stated and are followed in some cases by discussion of the background and rationale of the objective.

GENERAL OBJECTIVE

The following objectives shall apply to all waters of the Basin.

Nondegradation

Wherever the existing quality of water is better than the quality of water established herein as objectives, such existing quality shall be maintained unless otherwise provided by the provisions of the State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California", including any revisions thereto.

Objectives for Ocean Waters

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan), and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revisions thereto shall apply.

In addition to the provisions of the Ocean Plan and Thermal Plan, the following objectives shall also apply to all ocean waters of the Basin:

Thermal Plan

The "Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California", adopted by the State Water Resources Control Board on May 18, 1972, specifies water quality objectives, effluent quality limits, and discharge prohibitions related to thermal characteristics of interstate waters and waste discharges.

Ocean Plan

The "Water Quality Control Plan for Ocean Waters of California" was adopted by the State Water Resources Control Board on July 6, 1972. This plan establishes beneficial uses and water quality objectives for waters of the Pacific Ocean adjacent to the California Coast outside of enclosed bays, estuaries, and coastal lagoons. Also, the Ocean Plan prescribes effluent quality requirements and management principles for waste discharges and specifies certain waste discharge prohibitions.

The Ocean Plan also provides that the State Water Resources Control Board shall designate Areas of Special Biological Significance and requires wastes to be discharged a sufficient distance from these areas to assure maintenance of natural water quality conditions.

Bays and Estuaries Policy

The "Water Quality Control Policy for the Enclosed Bays and Estuaries of California" adopted by the State Water Resources Control Board on May 16, 1974, provides water quality principles and guidelines for the prevention of water quality degradation and to protect the beneficial uses of waters. Decisions by the Regional Board are required to be consistent with the provisions of this policy. This policy does not apply to wastes from vessels or land runoff except as specifically indicated for siltation and combined sewer flows.

WATER QUALITY OBJECTIVES

The water quality objectives which follow supersede and replace those contained in the "Interim Water Quality Control Plan for the San Francisco Bay Basin" (as updated); the "Water Quality Control Policy for Pacific Ocean, Pescadero Point to Mouth of Tomales Bay, Bolinas Lagoon, Drakes Estero, Limantour Estero, Portions of Tomales Bay, and Tidal Portions of Coastal Streams" (1967); and the "Water Quality Control Policy for Tidal Waters Inland from the Golden Gate within the San Francisco Bay Region" (1967).

Controllable water quality factors shall conform to the water quality objectives contained herein. When other factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, then controllable factors shall not cause any further degradation of water quality.

Controllable water quality factors are those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled.

Dissolved Oxygen

The mean annual dissolved oxygen concentration shall not be less than 6.0 mg/l nor shall the minimum dissolved oxygen concentration be reduced below 5.0 mg/l at any time.

pH

The pH value shall not be depressed below 7.0 nor raised above 8.5.

Objectives for Inland Surface Waters, Enclosed Bays, and Estuaries

The following objectives apply to all inland surface waters, enclosed bays and estuaries of the Basin.

Color

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

Tastes and Odors

Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance or adversely affect beneficial uses.

Floating Material

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

Suspended Material

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Settleable Material

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

Oil and Grease

Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

Biostimulatory Substances

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

Sediment

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas of 10 JTU or more; waters of characteristically low natural turbidity shall be maintained so that discharges do not cause visible, aesthetically undesirable contrast with the natural appearance of the water.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5.

Changes in normal ambient pH levels shall not exceed 0.2 units in waters with designated marine (MAR) beneficial uses nor 0.5 units in fresh waters with designated COLD or WARM beneficial uses.

The above objective encompasses the pH range usually recommended by the Department of Fish and Game and is consistent with the 0.2 limit of pH change in the California Ocean Plan. A greater maximum deviation is allowed in fresh waters which characteristically exhibit greater pH variation than well-buffered estuarine or marine waters. This increase in pH variation is not considered harmful within the overall limits specified.

Dissolved Oxygen

For all tidal waters, the following objectives shall apply:

In the Bay downstream of Carquinez Bridge	5.0 mg/l minimum
Upstream from Carquinez Bridge	7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as cold water habitat	7.0 mg/l minimum
Waters designated as warm water habitat	5.0 mg/l minimum

Areas of Special Biological Significance shall be maintained at a level of protection consistent with natural undegraded conditions uninfluenced by any controllable water quality factor. Where natural factors cause lower concentrations, controllable water quality factors shall not cause further reduction.

All waters designated as aquatic life habitat shall be maintained at Maintenance Level B, unless otherwise designated. In addition to these limiting numerical objectives, the lower ten percentile dissolved oxygen concentration value shall be determined as a function of dissolved oxygen content at saturation, in accordance with Figure 4-1 of the Basin Plan.

Bacteria

In tidal waters designated for contact recreation (REC-1), the total coliform concentration, based on a minimum of not less than five consecutive samples, shall not exceed a median value of 240/100 ml, nor shall any sample exceed a total coliform concentration of 10,000/100 ml. In addition, the fecal coliform concentration, based on a minimum of five consecutive samples, shall not exceed a maximum fecal coliform concentration of 400/100 ml.

At all areas where shellfish may be harvested for human consumption (SHELL), the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 ml nor shall more than 10 percent of the samples collected during any 30-day period exceed 230/100 ml for a five-tube decimal dilution test or 330/100 ml when a three-tube decimal dilution test is used.

In nontidal waters designated for contact recreation (REC 1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200/100 ml, nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml.

In nontidal waters designated for noncontact recreation (REC-2) and not designated for contact recreation (REC-1), the average fecal coliform concentration for any 30-day period, shall not exceed 2,000/100 ml nor shall more than 10 percent of samples collected during any 30-day period exceed 4,000/100 ml.

In nontidal waters used for domestic drinking water supply (MUN), the arithmetic average of at least five (5) samples collected over a thirty (30) day interval shall not exceed a total coliform concentration of 100 per 100 ml or a fecal coliform of 20 per 100 ml.

Temperature

Temperature objectives for *Enclosed Bays and Estuaries* are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California" including any revisions thereto.

In addition, the following temperature objectives apply to surface waters:

> The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
>
> At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.
>
> At no time or place shall the temperature of WARM waters be increased more than 5°F above natural receiving water temperature.

Toxicity

All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bio-assays of appropriate duration or other appropriate methods as specified by the Regional Board.

The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in *Standard Methods for the Examination of Water and Wastewater*, latest edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bio-assay.

In addition, effluent limits based upon acute bio-assays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established for specific toxicants will be established as sufficient data become available, and source control of toxic substances will be encouraged.

Ammonia

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits:

0.025 mg/l as N	Annual Median
0.4 mg/l as N	Maximum

Pesticides

No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 1, Article 4, Section 7019, Table 4, and listed below:

Pesticides:	mg/l
Aldrin	0.017
Chlordane	0.003
DDT	0.042
Bioldrin	0.017
Endrin	0.001
Heptachlor	0.018
Heptachlor epoxide	0.018
Lindane	0.056

Continued-

Pesticides:	mg/l
Methoxychlor	1.0
Organophosphurous and Carbamate compounds (as parathion in cholinesterase inhibition)	0.1
Toxophene	0.005

Herbicides:	mg/l
2, 4-D plus 2, 4, 5-T plus 2, 4, 5-TP	0.1

Total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in *Standard Methods for the Examination of Water and Wastewater*, latest edition, or other equivalent methods approved by the Executive Officer.

Sulfide

All waters shall be free from dissolved sulfide concentrations above natural background levels.

Chemical Constituents

Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the limits specified in California Adminstrative Code Title 17, Chapter 5, Subchapter 1, Group 1, Article 4, Section 7019, Tables 2, 3, and 4 and listed below:

Inorganic Chemicals

Constituent	Limiting Concentration, mg/l
Arsenic	.0.10
Barium	. 1.0
Cadmium	.0.01
Chromium	.0.05
Cyanide	. 0.2
Lead	.0.05
Mercury	0.005
Nitrate-N + Nitrite-N	. 10
Selenium	.0.01

Fluoride Concentration

Annual Average of Maximum Daily Air Temperature*	Fluoride Concentration, mg/l		
	Lower	Optimum	Upper
50-54	0.9	1.2	1.7
55-58	0.8	1.1	1.5
59-64	0.8	1.0	1.3
65-71	0.7	0.9	1.2
72-79	0.7	0.8	1.0
80-81	0.6	0.7	0.8

* Based on temperature data obtained for a minimum of five years.

Organic Chemicals

Constituent	Limiting Concentration mg/l
Carbon-alcohol extract (CAE-m)	3.0
Carbon-chloroform extract (CCE-m)	0.7
Foaming agent (MBAS)	0.5

Waters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use.

Note Standards for quality and quantity of delta outflow will be included in the final EMP.

Radioactivity

Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the limits specified in California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 1, Article 4, Section 7019, Table 5, and listed below:

Radioactivity	
Gross Beta	1,000 pc/l
Radium-226	3 pc/l
Strontium-90	10 pc/l

WATER QUALITY OBJECTIVES FOR SPECIFIC INLAND SURFACE WATERS

Alameda Creek Watershed

The following chemical quality limits shall be maintained in the surface waters of the Alameda Creek watershed above Niles:

TDS:	250 mg/l 90 day-arithmetic mean
	360 mg/l 90 day-90th percentile
	500 mg/l daily maximum
Chlorides:	60 mg/l 90 day-arithmetic mean
	100 mg/l 90 day-90th percentile
	250 mg/l daily maximum

Whenever natural factors cause the above limits to be exceeded, then, subject to the exception below, controllable water quality factors shall not cause further degradation.

Wastewater discharges that cause the above surface water limits to be exceeded may be allowed if part of an overall water-wastewater resource operational program developed by those agencies affected and approved by the Regional Board. Approval of the program by the Regional Board will be based upon a satisfactory demonstration that the discharge will not impair the beneficial uses of the surface and/or groundwaters.

Other Inland Surface Waters

As part of the State's continuing planning process, data will be collected and numerical water quality objectives will be developed for those mineral and nutrient constituents where sufficient information is presently not available for the establishment of such objectives.

Objectives for Groundwaters

The following objectives apply to all groundwaters of the Basin.

Tastes and Odors

Groundwaters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Bacteria

In groundwaters used for domestic or municipal supply (MUN) the median concentration of coliform organisms over any seven-day period shall be less than 2.2/100 ml.

Chemical Constituents

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the limits specified in California Administrative Code Title 17, Chapter 5, Subchapter 1, Group 1, Article 4, Section 7019, Tables 2, 3, and 4.

Groundwaters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use.

Radioactivity

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the limits specified in California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 1, Article 4, Section 7019, Table 5.

Specific Groundwaters

As part of the State's continuing planning process, data will be collected and numerical water quality objectives will be developed for those mineral constituents where sufficient information is presently not available for the establishment of such objectives.

Appendix B

Included in this appendix are possible projects to meet Bay Area municipal waste treatment system needs for the next 23 years. As required by Federal law, the list of recommended projects will be included in the Bay Area's 208 environmental management plan. After this plan has been approved by the State and the Environmental Protection Agency, Federal law requires that the Administrator of EPA shall not make any grant for construction of publicly owned treatment facilities under section 201 of the Federal Water Pollution Control Act, except for those facilities in conformance with the 208 plan.

This draft list may be modified as the air, water and solid waste recommendations are made consistent with one another in the development of a draft Environmental Management Plan, to be published in December.

Draft 20-year project list of municipal wastewater facilities

DRAFT

Sept. 6, 1977

Alameda County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
East Bay Municipal Utility District, Special Dist. No. 1	1246	EBMUD wet weather facilities	1- 600,00 2- 4,200,000 3- 51,400,000	II	1	2	3																					
EBMUD	1246	EBMUD wastewater reclamation facilities	1- 605,000 2- 3,500,000 3- 35,000,000	I		1	2	3																				
EBMUD		EBMUD wastewater solids management facilities	1- 220,000 2- 2,200,000 3- 22,000,000	I	1	2	3																					
City of Albany		Collection sewers	1- 3,000 2- 12,000 3- 135,000	III			1 2 3																					
City of Oakland		Collection system problems of pre-WW II Flatlands City-wide problem	1- 12,000 2- 118,000 3- 1,070,000	III			1 2 3																					
City of Oakland		Correction of collection system problems within Lake Merritt Area	1- 12,000 2- 118,000 3- 1,070,000	II			1 2 3																					
City of Oakland		Collection and transport facilities for Skyline and Panoramic Areas	1- 15,600 2- 65,000 3- 1,120,000	III			1 2 3																					
City of Alameda	1576	Interceptor from Bay Farm Island is deteriorated and has had recent failures	1- 1,000 2- 4,000 3- 45,000	III	1 2 3																							
East Bay Dischargers Authority (EBDA)	0868	Union S.D. Alvarado plant improvements - Alvarado treatment plant and pumping station.	1- 2- 3- 48,300,000	I		3																						
East Bay Dischargers Authority	0868	Oro Loma plant wet weather facilities to meet secondary treatment standards; Hayward plant and San Leandro plant improvements to meet secondary requirements	1- 300,000 2- 3,000,000 3- 27,000,000	I	1 2	3																						
East Bay Dischargers Authority		Union S.D. plant expansion and possible upgrading	1- 120,000 2- 1,200,000 3- 10,800,000	III		1		2	3																			
East Bay Dischargers Authority	1428	Reclamation-reuse study	1- 46,000 2- 2,500,000 3- 25,000,000	I	1		2	3																				
East Bay Dischargers Authority		EBDA transport and outfall facilities	1- 2- 3-130,000,000	I		3																						

Notes:

Step 1- Facilities Planning
Step 2- Plans and Specifications
Step 3- Construction
Project Groups - As defined by the State Water Resource Control Board (SWRCB)

ALAMEDA COUNTY-CONT'D

Implementing Agency	Project No. (SWRCB)	Description of Project		Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
EBDA/Alameda County		Collection and transport of sewage within unsewered areas of Eden Township and unincorporated canyon areas	1-	15,000	III			1																			
			2-	65,000				2																			
			3-	1,120,000				3																			
City of San Leandro	1431	Facilities plan for wastewater reclamation project	1-	12,000	I	1																					
			2-																								
			3-																								
City of Hayward	1442	Hayward interceptor sewer	1-	20,000	III	1																					
			2-	80,000		2																					
			3-	1,400,000		3																					
City of Hayward		Plant expansion	1-	120,000	III										1												
			2-	1,200,000											2												
			3-	12,000,000												3											
Castro Valley S.D.		Castro Valley collection sewers	1-	40,000	III			1																			
			2-	150,000				2																			
			3-	2,810,000				3																			
Livermore-Amador Valley Water Management Agency	1031	LAVWMA transport facilities to EBDA outfall for treated wastewater disposal	1-		I																						
			2-	2,000,000																							
			3-	20,200,000			3																				
LAVWMA	1572	Facilities plan for wastewater reclamation in Livermore-Amador area	1-	195,000	I	1																					
			2-																								
			3-																								
City of Livermore	1429	Livermore plant expansion by 1 mgd for wastewater reclamation project	1-	64,000	I	1																					
			2-	640,000			2																				
			3-	5,700,000			3																				
City of Livermore		Land acquisition for expansion of reclamation	1-	5,000	IV				1																		
			2-	50,000					2																		
			3-	2,070,000						3																	
City of Livermore		Plant expansion	1-	45,000	III										1												
			2-	450,000											2												
			3-	4,500,000												3											
City of Livermore		Land acquisition and spray irrigation facilities	1-	60,700	IV						1																
			2-	607,400							2																
			3-	6,074,500								3															
Valley Community Services Dist.	1125	VCSD plant expansion to consolidate with Pleasanton	1-		I																						
			2-																								
			3-	3,300,000			3																				
City of Pleasanton	1082	Pleasanton transport facilities to VCSD for treatment	1-		I																						
			2-																								
			3-	2,600,000			3																				
Alameda County Zone 7		Sewage management for unsewered areas outside LAVWMA	1-	50,000	III		1																				
			2-	150,000			2																				
			3-	1,300,000			3																				

Contra Costa County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
West Contra Costa Wastewater Management Agency	1154	Transport and treatment facilities in the area between Crockett and Richmond, including facilities for NPDES compliance at Richmond and San Pablo	1- 2- 3-25,000,000	I	3																							
City of Richmond		Collection system improvements	1- 2- 3- 4,000,000	III			1 2 3																					
San Pablo S.D.	1443	Facilities plan for wastewater reclamation	1- 10,000 2- 3-	I	1																							
City of Pinole	1577	Plant improvement and transport facilities to Rodeo joint outfall	1- 2- 200,000 3- 4,000,000	1	2 3																							
City of Pinole		Plant expansion	1- 2- 200,000 3- 2,700,000	1	2		3																					
Rodeo S.D.	1413	Rodeo S.D. treatment plant modifications and outfall extension	1- 2- 3- 2,000,000	I	3																							
Crockett-Valona S.D.	1412	Wet weather treatment plant and outfall	1- 2- 3- 2,000,000	I	3																							
Mt. View S.D.	1241	Facilities necessary to comply with NPDES declorination and 10:1 dilution requirements	1- 2- 21,000 3- 274,000		2 3																							
Mt. View S.D. and Central Contra Costa S.D.		Sewage collection and transport treatment and disposal for Near Oaks and Orinda	1- 60,000 2- 260,000 3- 5,380,000	III			1 2 3																					
Mt. View S.D.		Elimination of bypasses and overflows	1- 2- 3- 400,000	II			1 2 3																					
Contra Costa County S.D. No. 5	1242	Port Costa upgrading treatment to secondary level	1- 2- 18,000 3- 228.000	I	1	2 3																						
Contra Costa County S.D. No. 5		Collection sewers	1- 1,000 2- 4,000 3- 45,000	I			1 2 3																					
Central Contra Costa Sanitary Dist. (C.C.C.S.D.)	1000	C.C.C.S.D. secondary plant expansion	1- 2- 3- 3,200,000	I	3																							
C.C.C.S.D.	1269	C.C.C.S.D. solids disposal and energy recovery facilities	1- 2- 300,000 3-34,000,000	I	2	3																						

CONTRA COSTA COUNTY - CONT'D

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
C.C.C.S.D.		C.C.C.S.D. secondary plant expansion and upgrading to advanced treatment	1- 48,000 2- 480,000 3-48,000,000	III									1	2	3													
C.C.C.S.D.	1312	C.C.C.S.D. transport facilities to eliminate Bollinger Canyon leach line discharge	1- 2- 73,000 3- 600,000	I	2 3																							
City of Concord		Collection sewers (Stage II)	1- 18,100 2- 181,650 3- 1,816,500				1 2 3																					
City of Concord		Collection sewers (Stage III)	1- 18,000 2- 179,800 3- 1,789,500				1 2 3																					
Contra Costa County S.D. No. 7A	1002	C.C.C.S.D. No. 7A subregional facilities	1- 2- 2,000,000 3-33,000,000	I	2 3																							
Contra Costa County S.D. No. 7A		Collection sewers	1- 7,000 2- 26,000 3- 367,000	III			1 2 3																					
Oakley S.D.-C.C.C. S.D. No. 15	1416	Oakley S.D. plant improvements; transport facilities from C.C.C.S.D. No. 15 (Bethel Island) to Oakley for wastewater treatment	1- 2- 3- 5,500,000	I	3																							
City of Brentwood	1415	Brentwood treatment plant expansion	1- 2- 3- 720,000	I	3																							
Contra Costa County	1514	Facilities plan for countywide septage study	1- 25,000 2- 3-	I	1																							
Contra Costa County Water Dist.		Expansion of the ion exchange softening plant for reclaimed wastewater (from 15 mgd to 30 mgd)	1- 50,000 2- 150,000 3- 1,300,000	IV			1	2	3																			
Contra Costa County		Sand Hill wastewater management facilities	1- 5,000 2- 50,000 3- 445,000	III			1 2 3																					

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Sept. 6, 1977

Marin County

Implementing Agency	Project No. (SWRCB)	Description of Project		Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
Richardson Bay S.D.		Collection sewers	1-	8,000	III	1																							
			2-	31,000		2																							
			3-	461,000		3																							
Richardson Bay S.D.		Plant improvements	1-	2,000	III										1														
			2-	4,000											2														
			3-	35,000												3													
City of Sausalito		Collection sewers	1-	1,000	III			1																					
			2-	4,000				2																					
			3-	45,000				3																					
City of Mill Valley		Collection sewers	1-	4,000	III			1																					
			2-	17,000				2																					
			3-	209,000				3																					
City of Mill Valley	1409	Reclamation facilities	1-		IV																								
			2-																										
			3-	250,000		3																							
Homestead Valley S.D.		Collection sewers	1-	3,000	III			1																					
			2-	12,000				2																					
			3-	135,000				3																					
Marin County S.D. No. 1		Collection sewers	1-	15,000	III			1																					
			2-	65,000				2																					
			3-	1,120,000				3																					
Marin County No. 1		Plant expansion	1-	4,000	III										1														
			2-	41,000											2														
			3-	363,000												3													
San Rafael S.D.		Plant expansion	1-	3,000	III										1														
			2-	28,000											2														
			3-	255,000												3													
Las Gallinas Valley S.D. and Marin Municipal W.D.	1256	Reclamation facilities	1-		I																								
			2-																										
			3-	1,100,000		3																							
Las Gallinas Valley S.D.		Collection sewers	1-	20,000	III			1																					
			2-	85,000				2																					
			3-	1,495,000				3																					
Las Gallinas Valley S.D.		Plant expansion	1-	4,000	III										1														
			2-	41,000											2														
			3-	363,000												3													

MARIN COUNTY - CONT'D

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000
Novato S.D.	1058	Subregional treatment and transport facilities for South Sonoma/Eastern Marin	1- 2- 7,000,000 3-120,000,000	I	2	3																					
Novato S.D.		Novato treatment plant expansion	1- 6,000 2- 58,000 3- 507,000	III										1 2	3												
Novato S.D.		Ignacio treatment plant expansion	1- 5,000 2- 50,000 3- 434,000	III										1 2	3												
Marin Municipal W.D. and Marin County S.D. No. 1	1257	Reclamation facilities - lower Ross Valley	1- 2- 20,000 3- 275,000	I	2 3																						
Marin County		Collection system in unsewered areas of San Geronimo Valley	1- 30,000 2- 115,000 3- 2,055,000	III			1 2 3																				
North Marin County Water Dist.	1313	Olema and Point Reyes National Seashore Headquarters treatment and land disposal facilities	1- 2- 80,000 3- 1,000,000	I	2 3																						
North Marin County Water Dist.	1285	Point Reyes Station treatment and disposal facilities	1- 2- 80,000 3- 1,000,000	I	2 3																						
Stinson Beach County Water Dist.	1207	Interceptor sewers, treatment plant, and disposal facilities	1- 2- 400,000 3- 4,000,000	I	2 3																						
California Dept. of Parks and Recreation		Muir Beach collection, treatment, and disposal facilities	1- 15,000 2- 65,000 3- 1,120,000	I					1	2 3																	
California Dept. of Parks and Recreation	1317	Angel Island State Park interceptor sewer and land disposal facilities	1- 2- 100,000 3- 750,000	I	2 3																						

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Sept. 6, 1977

Napa County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
City of Calistoga		Collection Sewers	1- 4,000 2- 18,000 3- 228,000	I			1 2 3																					
Napa S.D. and Carneros Water District	1437	Facilities plan for reclamation potential	1- 70,000 2- 100,000 3-4,500,000	I	1	2	3																					
Napa S.D.		Collection Sewers	1- 40,000 2- 150,000 3-2,860,000	III			1 2 3																					
Napa S.D.		Outfall line to the San Francisco Bay	1- 50,000 2- 400,000 3-8,000,000	I														1	2	3								
City of Yountville	0979	Facilities to comply with Basin Plan objectives (joint facilities with Veterans Home)	1- 2- 3-2,500,000	I	3																							
City of St. Helena	1316	Upgrading treatment and complying with Basin Plan objectives	1- 2- 66,000 3- 660,000	I	2 3																							
City of St. Helena		Thomas Lane interceptor	1- 1,000 2- 6,000 3- 63,000	III	1 2 3																							
Napa County	1314	Treatment and/or transport for unsewered Community-Edgerly Island	1- 2- 35,000 3- 475,000	I	2 3																							
Napa County	1314	Collection system for unsewered community-Edgerly Island	1- 2- 30,000 3- 470,000	III	2 3																							
Napa County	1525	Facilities plan for countywide septage study	1- 25,000 2- 3-	I	1																							
Napa County		Collection system for unsewered area of Angwin	1- 10,000 2- 40,000 3- 720,000	III		1	2 3																					
Napa County		Treatment system for unsewered area of Angwin.	1- 20,000 2- 800,000 3-1,430,000			1	2 3																					

San Francisco

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	20(20(
San Francisco City and County	1099	Southeast treatment plant expansion	1- 2- 3-200,000,000	I	3																							
San Francisco City and County	1252	Ocean outfall	1- 2- 3-100,000,000	I	3																							
San Francisco City and County	1253	Westside pump station and tunnel	1- 2- 9,500,000 3-130,000,000	I	2 3																							
San Francisco City and County	1289	Southwest dry weather primary and secondary plant	1- 2- 15,000,000 3-215,000,000	I	2		3																					
San Francisco City and County	1399	Islais Creek pump station and storage facilities	1- 2- 5,000,000 3-100,000,000	I		2	3																					
San Francisco City and County	1399	Sunnydale/South Basin facilities	1- 2- 5,000,000 3-100,000,000	I		2	3																					
San Francisco City and County	1399	North-South highlevel crosstown transport Stage I	1- 2- 5,000,000 3-100,000,000	I		2	3																					
San Francisco City and County	1399	North-South highlevel crosstown transport Stage II	1- 2- 5,000,000 3-100,000,000	I			2	3																				
Port of San Francisco		Collection sewers	1- 5,000 2- 21,000 3- 274,000	III			1 2 3																					
San Francisco City and County	131	Wastewater solids management facilities	1- 300,000 2- 3,000,000 3- 30,000,000	I	1	2	3																					
San Francisco City and County	1315	Log Cabin Ranch School treatment plant additions	1- 2- 8,000 3- 63,000	II		2 3																						

San Mateo County

Sept. 6, 1977

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
South Bayside System Authority	1114	Interceptor sewer and subregional plant for Menlo Park, Redwood City, San Carlos and Belmont	1- 2- 3-32,000,000	I		3																						
South Bayside System Authority		Wastewater reclamation project for industrial use and landscape irrigation	1- 40,000 2- 260,000 3- 3,500,000	IV							1 2	3																
City of Redwood City		Wastewater reclamation project for landscape irrigation	1- 30,000 2- 206,000 3- 3,364,000	IV			1 2	3																				
City of Redwood		Collection sewers near Emerald Lake Hills	1- 8,000 2- 75,000 3- 658,000	III			1 2 3																					
City of San Mateo	1445	Facilities plan for reclamation potential	1- 10,000 2- 30,000 3- 600,000	I	1 2 3																							
City of San Mateo		Collection system repairs	1- 60,000 2- 600,000 3- 5,340,000	III			1 2 3																					
City of Foster City		Wastewater reclamation project re-using treated wastewater within Foster City	1- 28,000 2- 220,000 3- 2,252,000	IV		1	2	3																				
North Bayside System Unit Agencies	1235	South San Francisco-San Bruno plant improvements (to meet NPDES coliform and toxicity requirements)	1- 2- 3- 2,120,000	I		3																						
North Bayside System Unit Agencies	1267	Solids Management for Burlingame, Millbrae, and South San Francisco-San Bruno	1- 2- 3- 3,500,000	I		3																						
North San Mateo County S.D.	1439	Facilities plan for ultimate subregional sludge disposal	1- 25,000 2- 3-	I	1																							
City of Millbrae	1440	Pump station and interceptor	1- 3,000 2- 11,000 3- 126,000	III	1 2 3																							
City of Millbrae		Reclamation facilities	1- 5,000 2- 50,000 3- 500,000	IV			1 2 3																					
City of Burlingame	1444	Facilities plan for reclamation potential	1- 5,000 2- 3-	I	1																							

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Sept. 6, 1977

SAN MATEO COUNTY - CONTINUED

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000
City of Burlingame		Elimination of by-passes and overflows	1- 20,000 2- 130,000 3- 1,150,000	II			1 2 3																				
San Francisco International Airport		S.F. Airport plant improvement	1- 20,000 2- 280,000 3- 6,000,000	III			1	2	3																		
San Francisco International Airport		Wastewater reclamation project re-using treated wastewater for landscape irrigation within the the Airport	1- 20,000 2- 280,000 3-10,000,000	IV		1	2	3																			
Cities of South San Francisco-San Bruno		Wastewater reclamation project for industrial use	1- 20,000 2- 280,000 3- 6,000,000	IV			1	2	3																		
North San Mateo County S.D.		Reclamation Facilities	1- 2- 380,000 3- 4,800,000	IV		2 3																					
Town of Colma	1441	Sewage interceptor system	1- 14,000 2- 54,000 3- 932,000	III	1 2 3																						
City of Pacifica		Infiltration/inflow study and necessary sewer repairs to eliminate by-passing and overflows of untreated sewage	1- 80,000 2- 200,000 3- 1,800,000	III		1 2 3																					
City of Pacifica		Wastewater reclamation project for landscape irrigation	1- 30,000 2- 3-	IV		1	2 3																				
Sewer Authority Mid-Coastside	1022	Subregional facilities for Half Moon Bay, Montara, and Granada	1- 2- 3- 6,800,000	I	3																						
San Mateo County	1436	Collection system for Emerald Lakes Hills	1- 58,000 2- 580,000 3- 5,300,000	I	1 2 3																						
San Mateo County		Collection and treatment system for unsewered areas - Cuesta La Honda	1- 30,000 2- 120,000 3- 2,150,000	III			1 2 3																				
San Mateo County		Collection and treatment system for unsewered areas - Redwood Terrace	1- 10,000 2- 36,000 3- 554,000	III			1 2 3																				
San Mateo County		Collection system for unsewered areas - Woodside Highland	1- 15,000 2- 65,000 3- 1,120,000	III			1 2 3																				

Sept. 6, 1977

SAN MATEO COUNTY - CONTINUED

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	20
San Mateo County		Collection system for unsewered areas - Stonegate	1- 10,000 2- 36,000 3- 554,000	III			1 2 3																					
San Mateo County		Collection system for unsewered areas - Los Trancos Woods	1- 30,000 2- 120,000 3- 2,150,000	III				1 2 3																				
San Mateo County		Collection system for unsewered areas - Paloma Park	1- 40,000 2- 165,000 3- 3,195,000	III				1 2 3																				
San Mateo County		Collection system for unsewered areas - Arrowhead Meadows	1- 15,000 2- 65,000 3- 1,120,000	III				1 2 3																				
San Mateo County		Collection system for unsewered areas - Alpine Hills	1- 20,000 2- 90,000 3- 1,590,000	III				1 2 3																				
San Mateo County		Collection system for unsewered areas - Woodside Hills	1- 30,000 2- 280,000 3- 2,490,000	III				1 2 3																				
San Mateo County		Collection system for unsewered areas - Woodside Oaks	1- 20,000 2- 90,000 3- 1,590,000	III					1 2 3																			
San Mateo County		Collection system for unsewered areas - Vista Verde	1- 20,000 2- 90,000 3- 1,590,000	III					1 2 3																			
San Mateo County		Collection system for unsewered areas - Skylonda	1- 20,000 2- 90,000 3- 1,590,000	III					1 2 3																			
San Mateo County		Collection system for unsewered areas - Skywood	1- 10,000 2- 36,000 3- 554,000	III					1 2 3																			
San Mateo County		Collection system for unsewered areas - Canada Road	1- 10,000 2- 36,000 3- 554,000	III					1 2 3																			
San Mateo County		Collection system for unsewered areas - County Club Estate	1- 10,000 2- 36,000 3- 554,000	III					1 2 3																			

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Sept. 6, 1977

Santa Clara County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000
City of Palo Alto	1076	Solids handling facilities	1- 2- 110,000 3- 2,000,000	I	2 3																						
City of Palo Alto		Process control and data management system	1- 2- 3- 270,000	III		1 2 3																					
City of Sunnyvale		Enlargement of treatment plant capacity	1- 48,000 2- 480,000 3- 4,300,000	III			1	2	3																		
Cities of San Jose/ Santa Clara	1381	Solids handling facilities	1- 2- 1,000,000 3-20,000,000	I	2	3																					
Cities of San Jose/ Santa Clara		Pretreatment facilities addition	1- 7,000 2- 70,000 3- 702,000	III						1 2	3																
Cities of San Jose/ Santa Clara		Expansion of advanced treatment facilities	1- 78,500 2- 784,600 3- 7,846,000	III						1 2	3																
Cities of San Jose/ Santa Clara		Sludge disposal facilities	1- 27,200 2- 271,800 3- 2,718,000	III			1 2	3																			
Cities of San Jose/ Santa Clara		Sludge processing facilities	1- 22,100 2- 221,000 3- 2,210,000	III									1 2	3													
City of Santa Clara	1438	Northside pump station and force main enlargement	1- 12,000 2- 120,000 3- 1,200,000	III	1 2 3																						
City of Santa Clara		Collection sewers	1- 7,000 2- 30,000 3- 443,000	III		1 2 3																					
Cupertino S. D. and City of Santa Clara		Interceptor sewer	1- 2- 3- 2,000,000	III		1 2 3																					

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Sept. 6, 1977

SANTA CLARA COUNTY - CONTINUED

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000 2001
Milpitas S.D.		Collection sewers	1- 8,000 2- 34,000 3- 508,000	III			1 2 3																					
Santa Clara Valley Water District and Cupertino S.D.	1433	Facilities plan for reclamation project	1- 70,000	I	1																							
Santa Clara Valley Water District	1403	Joint water reclamation project between Milpitas S.D. and Santa Clara Valley W.D.	1- 2- 3- 1,400,000	I		3																						
Santa Clara Valley Water District		Evaluation of expanded salt water intrusion barrier for South Bay	1- 80,000 2- 3-	I				1																				
South Bay Dischargers Authority	1135	Subregional interceptor and outfall	1- 2- 4,000,000 3-80,000,000	I		2	3																					
Santa Clara County S.D. No. 4		Lake Canyon and Montevina collection sewers	1- 3,000 2- 14,000 3- 173,000	III			1 2 3																					
City of Gilroy	1019	Gilroy-Morgan Hill joint secondary plant	1- 2- 200,000 3- 5,000,000	I		2 3																						
Cities of Gilroy-Morgan Hill		Interceptor from Morgan Hill to Gilroy	1- 25,000 2- 105,000 3- 1,870,000	III	1 2 3																							
City of Gilroy		Plant expansion	1- 20,000 2- 200,000 3- 2,000,000	III					1	2	3																	

Solano County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
City of Benicia	0988	Benicia plant and outfall improvements	1- 2- 3-3,600,000	I	3																							
Vallejo Sanitation and Flood Control District (VS&FCD)	1573	Facilities plan for wastewater reclamation	1- 100,000 2- 3-	I	1																							
Vallejo S&FCD, Napa S.D. and American Canyon C.S.D.	1268	Solids management facilities	1- 2- 100,000 3-2,500,000	I	2 3																							
Fairfield-Suisun Sewer District	1430	Addition of solids handling capacity at sub-regional plant	1- 100,000 2- 400,000 3-9,000,000		1	2 3																						
City of Fairfield		Fairfield-Suisun subregional tertiary plant expansion	1- 100,000 2- 400,000 3-9,000,000	III		1 2	3																					
City of Fairfield		Fairfield-Suisun subregional tertiary plant expansion	1- 200,000 2-2,200,000 3-17,800,000	III									1	2	3													
Solano County	1535	Facilities plan for countywide septage study	1- 25,000 2- 3-	I	1																							
Solano County		Collection system for unsewered area-Glen Cove	1- 30,000 2- 120,000 3-2,150,000	III			1 2 3																					
Solano County		Collection system for unsewered area-Green Valley, Suisun Valley, Cordelia	1- 160,000 2- 640,000 3-14,200,000	III			1 2 3																					

Sept. 6, 1977

Sonoma County

Implementing Agency	Project No. (SWRCB)	Description of Project	Estimated Cost by Steps	Priority Group	Fiscal Year (and assigned steps) 77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-2000	2000-2001
Sonoma Valley County S.D.	0834	Sonoma Valley C.S.D. secondary plant improvements and expansion	1- 2- 3-10,800,000	I			3																					
Sonoma Valley County S.D.	1434	West trunk interceptor to eliminate overflow and bypasses	1- 30,000 2- 130,000 3-2,340,000	III		1 2 3																						
Sonoma Valley County S.D.		Jack London Country Club Estates collection system	1- 5,000 2- 21,000 3- 274,000	III				1 2 3																				
Sonoma Valley		Kenwood collection system	1- 25,000 2- 105,000 3-1,400,000	III					1 2 3																			
Sonoma Valley County S.D.		Collection system westerly of the Petaluma City limits	1- 20,000 2- 80,000 3-1,400,000	III						1 2 3																		
City of Petaluma		Expansion of irrigation system	1- 6,000 2- 57,000 3- 500,000	III										1 2	3													
Sonoma County		Construction of storage, pipeline and irrigation distribution system	1- 250,000 2-2,600,000 3-23,800,000	IV									1	2	3													
Sonoma County		Collection system for Petaluma Blvd., Bailey Ave., Gossage Ave., Jessie Lane and Skillman Lane	1- 15,000 2- 150,000 3-1,500,000	III				1 2 3																				
REGIONAL																												
Regional reclamation and reuse of wastewater management group	1432	Regional reclamation study	1-2,000,000 2- 3-	I	1																							

Appendix C

Direct industrial waste discharges

DIRECT INDUSTRIAL DISCHARGES

Table C1 lists significant direct industrial discharges in the region.

Treatment levels for direct industrial discharges are specified in the Federal Pollution Control Act Amendments of 1972. Industrial dischargers were required to install "best practicable treatment" by July, 1977. "Best practicable treatment" is roughly equivalent to secondary treatment for municipal discharges. All industrial dischargers in the region have met or are close to meeting this requirement.

The Act also requires that industrial dischargers install "best available treatment" by July, 1983. "Best available treatment" has been defined on an industry-by-industry basis and usually includes advanced wastewater treatment methods. Some of the industrial dischargers in the region already meet this requirement. Most will have to install further treatment facilities, however.

Table—C1.
Direct industrial dischargers

Location	Discharger Name	Process[a] Flow (MGD)	Once-Through[b] Flow (MGD)
Marin-Sonoma	No significant discharges		
Napa-Solano			
	Kaiser Steel Co. Shipyard	-	0.4
Vallejo-Mare Island	Mare Island Naval Shipyard	-	1.5
Benicia	Exxon Co.	2.2	-
Contra Costa			
Antioch	Crown Zellerbach	3.8	8.4
	E.I. Dupont de Nemours & Co.	1.5	-
	Fibreboard Corp.	13.0	-
	Hickmott Foods, Inc.	0.6	1.0
	PG&E-Antioch	0.7	600
Pittsburg	Allied Chemical Corp.	1.6	1.1
	Dow Chemical, USA	0.5	4.0
	PG&E-Pittsburg	0.3	896
	U.S. Steel Corp.	8.0	11.3
Central Contra Costa	Lion Oil Co.	4.5	4.5
	PG&E-Avon	0.3	-
	PG&E-Martinez	0.2	-
	Shell Oil Co.	3.8	-
Crockett-Port Costa	C&H Sugar Co.	2.7	17.6
Rodeo	PG&E-Oleum	0.2	80
	Union Oil Co.	2.1	40
Pinole	Pacific Refining	0.1	-
	Valley Nitrogen	1.8	-
Richmond	Chevron, USA	19.5	97
	Willamette Iron & Steel Co. Shipyard	-	2.4
East Bay			
EBMUD	Colgate-Palmolive Co.	-	0.6
	DeLaval Turbine Co.	0.9	-
	Gerber Products Co.	0.5	-
	Merritt Ship Repair Co.	-	0.3
	Todd Shipyard Co.	-	2.1
Newark	FMC Corp.	0.8	-
Livermore-Valley	No significant discharges[c]		
South Bay	No significant discharges		
San Mateo			
Redwood City	Marine World-Africa USA	-	13
So. SF Airport, San Bruno	Merck & Co.	-	3.6
	San Francisco Airport	1.5	-
San Francisco			
Southeast	Bethlehem Steel Shipyard	-	2.5
	PG&E-Hunters Point	0.2	280
	PG&E-Potrero	-	350
	Triple A Shipyard	-	3.7
Regional Total, Industry		78.3	

[a] Process flow is the flow of wastewater that results from industrial processing activities. It is often heavily contaminated.

[b] Once-through flow is water withdrawn from the receiving water, used once for cooling purposes and returned to the receiving water. Return water contains waste heat but is usually otherwise uncontaminated.

[c] Some concern has been expressed regarding discharges of radioactive waste from Vallecitos Nuclear Center. Analysis indicates that this does not appear to be a significant source of pollutants. The discharge complies with requirements set by the Regional Water Quality Control Board. Some independent check on the self-monitoring program may be desirable however.